# Products finishing

Volume 9 AUGUST, 1945 Number 11

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**ROBERT I. SHORE**
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*Consulting Editors*
BRYANT W. POCOCK
H. LEROY BEAVER

*Contributing Editor*
C. B. F. YOUNG

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Products finishing

# Value Received

The very foundation of all chemical reactions is that a chemical equation must be balanced. You can't get any more tin out of a stannate bath than there is in it, and what's there is accountable.

It seems to be an irrefutable law of nature that any conversion shall be accompanied by equity. Change there is and always may be, considering the dynamics of our universe, but equality seems to have a fine way of persisting throughout even the most intricate of alterations.

If it is impossible to get something for nothing out of his plating solutions, the metal finisher should consider it equally absurd to expect a profitable income without the expenditure of commensurate value. An honest return for a full measure is a balanced equation. Anything tending to disturb this relation unbalances it and sets in motion forces which any economist knows will result in eventual disaster. Equity will persist, but its form will be undesirable.

Those firms, both large and small, whose business practices are above reproach and whose ethical standards are founded upon natural law are the firms which endure. So it is with the individual. He who works for a man in the truest sense gives value for value in everything that he does. He carries out his job to the best of his ability and he upholds his boss and the firm he represents on every possible occasion. He not only expects his wages when they are due, he also wages his dues when they are expected.

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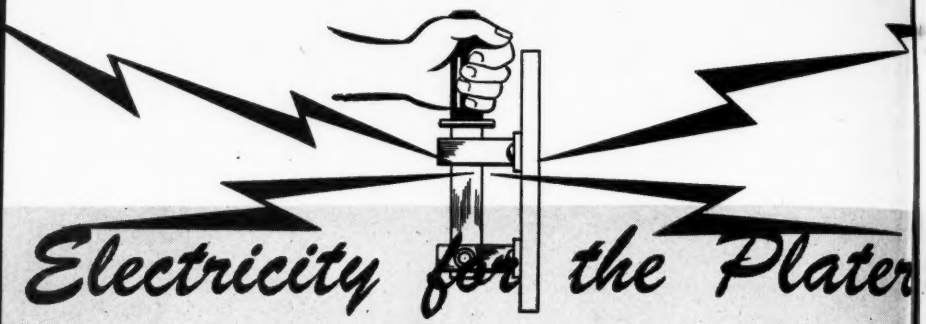

# Electricity for the Plater

D. A. COTTON

THE art of plating metal upon metal or upon other materials is an electrochemical process and as such is dependent upon the intelligent use of both chemical compounds and electric current. Much has been written to educate the plater in the chemical phases of his work and it is therefore fitting that he should also have a working knowledge of the fundamental electrical principles underlying the processes of cleaning and plating.

*This article is the first of a series to be published in forthcoming issues of PRODUCTS FINISHING, the purpose of which is to present those basic laws of electricity as are deemed essential to a thorough understanding of the proper use of plating baths and plating equipment. Save the copies in which these articles appear for future reference.*

It is logical that a study of the basic principles of electricity should be prefaced by a brief historical outline of the development of knowledge pertaining to electrical science. It is interesting to start with the meager bits of information which made up man's first knowledge of electricity and to follow step by step the gradual accumulation of facts that finally resulted in the evolution of the science which has contributed so much to the comfort and service of mankind.

The word "electricity" is derived from the word "electron" which was the Greek name for amber. Amber is a fossilized resin which is found in many localities throughout the world and in large quantities along the shores of the Baltic and the North Seas. It is still commercially mined in East Prussia.

It is found in many colors but the golden yellow amber was most highly prized among ancient peaples for making beads and other articles of adornment. Amber ornaments have been found in the tombs of Mycenae dating back to 2,000 years before Christ; in neolithic remains in Denmark and with relics of the bronze age in England.

It is not known just when that peculiar property which causes amber, when rubbed, to attract light objects was first discovered, but Thales of Miletus was probably the first to record this attractive force of amber some time around 600 B. C. Pliny, the Roman historian and writer, re-

counts that Syrian women gave to amber the name "harpaga" meaning "clutcher." While these women spun with the distaff wearing their amber ornaments or perhaps even using spindles made of amber, they may have noticed that the amber attracted light particles of lint or straw.

It is likely that acquaintance with the magnetic iron ore, magnetite, which became known as lodestone or leading stone, came to mankind at a later period in history than knowledge of amber. At any rate, its properties of attracting pieces of iron and of pointing north and south when freely suspended, were known several centuries before Christ.

Legend relates that a shepherd, named Magnes, while tending his flock, noticed that the nails in his shoes and the iron tip of his staff adhered to a certain rock formation. Hence, the name Magnes stone or magnet, was given to the mineral. It is more likely that it got its name from the city of Magnesia in Asia Minor, where there were large deposits of magnetic iron ore.

For several centuries, study of the peculiar properties of amber and magnetite followed along parallel lines. It was the same Greek philosopher, Thales, previously mentioned and sometimes called the "Father of Science," who first started questioning the mysterious powers of the lodestone, which so much resembled those of amber.

A graduate of Syracuse University in 1906 with a degree in electrical engineering, Mr. Cotton began his business career in the test department of the General Electric Company, Schenectady, New York, and later entered its engineering department. For ten years, he was engaged in laboratory work combining electrical and chemical research.

After thirteen years with the General Electric Company, Mr. Cotton came to Anderson, Indiana, to start a chemical laboratory for the present Delco-Remy Division of General Motors Corporation. Up to 1923, he was in charge of its engineering laboratories, after which he went into the process department and was put in technical charge of the electroplating work to institute laboratory control of all plating processes. In 1928, the process department began a new laboratory of which Mr. Cotton is still the head. This laboratory is engaged in making chemical, metallographic, and spectrographic analyses of all materials used in the fabrication of Delco-Remy products and controls cleaning, plating, and other processing solutions.

Mr. Cotton is a member of the American Electroplaters' Society, the American Society for Metals, The Electrochemical Society, and the Optical Society of America. In 1936, he had the honor of receiving the A.E.S. Gold Medal for the best paper of the year which was presented at the Bridgeport, Connecticut, convention in 1935 and was entitled "Optimum Metal Content for a Nickel Bath."

*(Photo of Mr. Cotton Courtesy Dave Payton, Delco-Remy)*

Up to the time of St. Augustine, who lived several centuries after Thales, the attractive force of amber and of the lodestone were assumed to be alike. St. Augustine showed the first signs of a perception of the difference between them in stating that the lodestone attracts iron but refuses to move straws. However, about twelve centuries passed before the world really distinguished between the electric or amber-like and the magnetic or lodestone-like phenomena.

Since we are to study the basic laws of electricity as they apply to the science of electroplating, it is only logical that we

should consider briefly the evolution of knowledge concerning electricity.

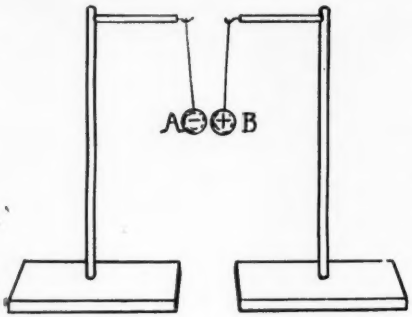


Fig. 1—Unlike charges attract each other

So far we have three main facts:

(1) Amber when rubbed by certain materials attracts light objects such as lint, straw, or feathers.

(2) A lodestone or piece of magnetic iron ore attracts pieces of iron to itself.

(3) A lodestone when suspended so as to swing freely comes to rest in a generally north and south position.

As we shall see later, the action of the amber under friction was actually an electrical manifestation, but the action of the lodestone was merely one of magnetism, which was not primarily an electrical phenomenon.

As stated previously, the behaviour of these two subtances, amber and magnetite, was accepted to be alike clear up to the middle of the fifteenth century. Finally, Cardan about 1501 definitely brought out the facts that amber attracted certain light objects but never iron, whereas the magnet picked up iron but had no attraction for other objects.

About a century later, Sir William Gilbert in 1600 discovered that many other substances besides amber became charged by friction. He called these bodies "electrics" and bodies which would take no charge, "non-electrics."

About 1675, Boyle first used the word "electricity" to designate this mysterious agent which produced these phenomena. In 1729, Gray showed that electrification of a body does not depend so much on the nature of the substance as upon its being insulated from the ground. All bodies may be charged if properly insulated. Gray also demonstrated that Gilbert's "electrics" were non-conductors and his "non-electrics" were conductors.

About 1733, DuFay first brought out the fact that there was more than one kind of electric charge. For instance, a glass rod rubbed with silk apparently gave a different charge from that produced by rubbing sealing wax with a piece of flannel. He called the charge produced by rubbing glass with silk "vitreous" and that excited by friction of flannel upon amber, sealing wax, hard rubber, and such substances, "resinous." Later, Benjamin Franklin called the "vitreous" electric charge "positive" and the "resinous," negative.

In about 1629, Cabaeus had shown

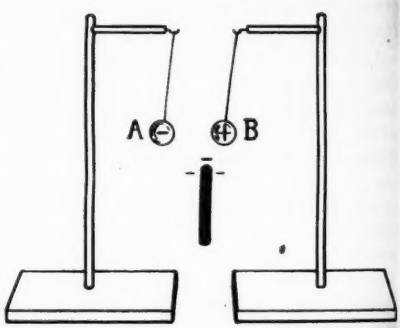


Fig. 2—Like charges repel, unlike attract

that bodies carrying unlike charges attract each other, but it was a hun-

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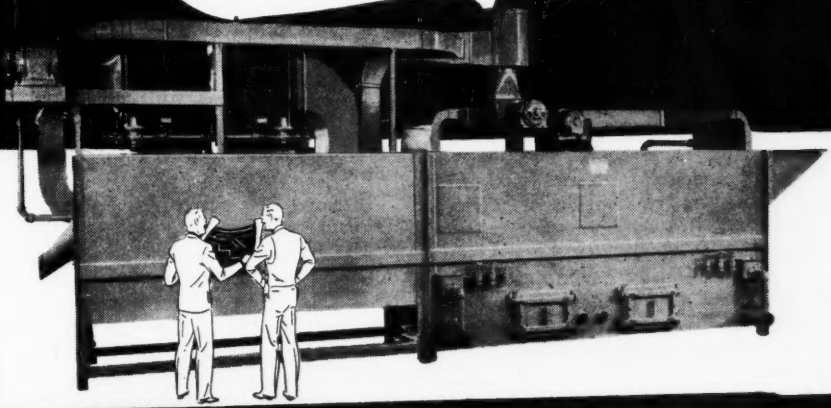

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dred years later that DuFay showed that bodies with like charges repel each other.

In 1663, Von Guericke produced a machine for making static electricity. Von Kleist of Pomerania did the first work on making a condenser to store electric charges, but because the work was finished by Van Musschenbroek at the University of Leyden,

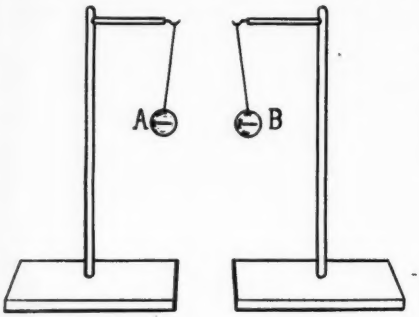


Fig. 3—Charging by contact

it became known as the Leyden jar.

Desaguiliers first conceived the idea of atmospheric electricity and that clouds might be electrified. This is what Benjamin Franklin in 1747 proved by his famous experiment of flying a kite during a thunder storm. He showed that there was in the clouds an electric charge just like that produced by friction of various bodies and proved conclusively that lightning was electricity.

This practically completes the story of the evolution of knowledge concerning electrical charges produced by friction between various substances.

For a time, we carried the development of knowledge of amber-like materials along with that of the magnetic phenomena. As soon, however, as it became evident that there was a distinction between these two sets of phenomena, it was more logical to follow the work on static electricity through to its end.

Note that we have used the word "static" as applied to the kind of electricity on charged bodies. Frictional charges are normally not in a state of motion; therefore, the term "static," which means "stationary," is given to this type of electricity.

At a later time, we will resume the tracing of the development of knowledge concerning the magnet, which is the basis of the production of dynamic or current electricity, or electricity in motion. We will now summarize the important facts growing out of the study of electric charges which culminated in the work of Franklin.

If we cut a piece of pith from the center of a corn stalk and make it into a ball, we have an ideal light object to use for demonstrating some of the laws of static electricity. The ball should be suspended by a light thread of insulating material such as silk.

If a glass rod be rubbed with a piece of silk, the glass will receive a charge which Benjamin Franklin called positive. This is an arbtirary designation which science has continued to use. The silk cloth will likewise have an equal negative charge.

If now, the glass rod be brought near the pith balls, they will be attracted toward the rod; or if the silk be brought near them, they will also be attracted to it. If, however, they touch either the rod or the silk, they will acquire a charge by conduction and will be immediately repelled. The two pith balls will then also repel each other.

In the following table, any substance becomes positively charged when rubbed with and then separated from any substance below it in the table.

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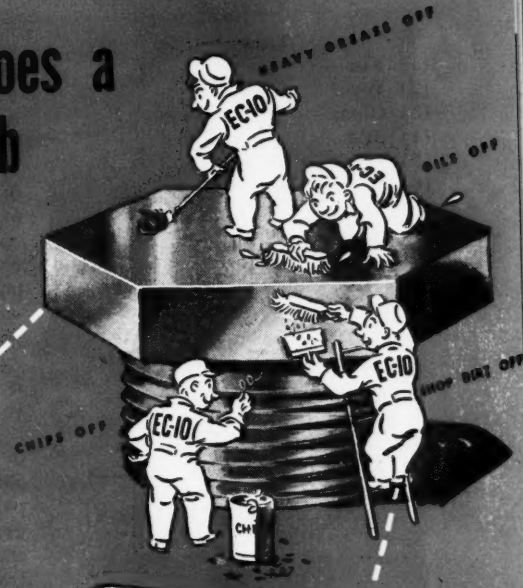


## FUSE PLUGS
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**EQUIPMENT USED** — A 200 gal. solvent dip tank followed by a spray rinse and a 325 gal. reverse current alkali cleaning tank followed by a dip rinse tank.

**METHOD**

**PART 1—PRECLEANING**

1. Use Pennsalt EC-10 concentrated, room temperature; soak for 30 seconds.
2. Cold water spray rinse.

**PART 2—ANODIC CLEANING**

3. Use Pennsalt K-7 at 50 to 100 amps./sq. ft. at 8 oz./gal., 200° F. for 30 seconds.
4. Hot water rinse.
5. Muriatic acid dip.
6. Cold water rinse.
7. Zinc Electroplate.
8. Hot water rinse.
9. Hot "Iridite" dip and then dry air.

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**Table I**

(1) Fur
(2) Wool
(3) Glass
(4) Silk
(5) Ebonite
(6) Sealing Wax
(7) Rosin
(8) Sulfur

Now let us consider some of the basic facts concerning electric charges. Rub an ebonite rod with

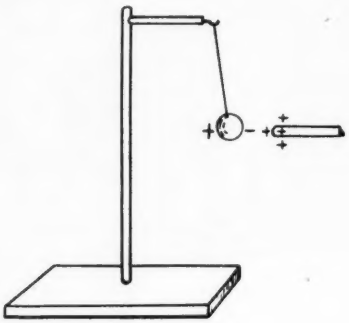


Fig. 4—Charging by induction

a piece of fur and separate them. Then touch the pith ball **A**, Fig. 1, with the ebonite. This give **A** a negative or minus charge.

Rub a glass rod with a piece of silk, separate them and then touch **B** with the glass rod. This gives **B** a positive or plus charge and the two balls will now have an attraction for each other.

Now referring to Fig. 2, bring the ebonite rod near the two balls and **A** will be repelled from the ebonite while **B** will be attracted toward it.

Allow **B** to touch the ebonite and **B** will lose its positive charge receiving a negative one (see Fig. 3), after which there will then be a repelling force between the two balls **A** and **B.**

These are examples of charging by contact.

If an uncharged pith ball suspended on a silk thread be brought near a positively charged glass rod (see Fig. 4), the ball will be attracted toward the rod. This is because the ball has electricity on it but the amount of positive equals the amount of negative, thus neutralizing each other. When the positively charged rod approaches the ball, the strong charge on the rod pulls the negative portion of electricity on the ball to the side nearest the rod and repels the positive portion to the side farthest away. Thus, since the negative side is closer to the rod than the positive, the ball will be attracted.

If the ball be touched by the finger or other conductor on its positive side while under induction, the repelled positive charge will go to ground, leaving only the negative charge on the ball and, thus, its attraction for the rod will be increased.

Now let us summarize the facts that we have brought out concerning charged bodies:

(1) A body can be electrified by contact with another dissimilar body and separation from it.

(2) The charges developed are opposite in kind and equal in magnitude.

(3) A body can be electrified by contact with an electrified body by drawing a charge from the latter.

(4) An electrified body becomes discharged by contact with the hand or other grounded object.

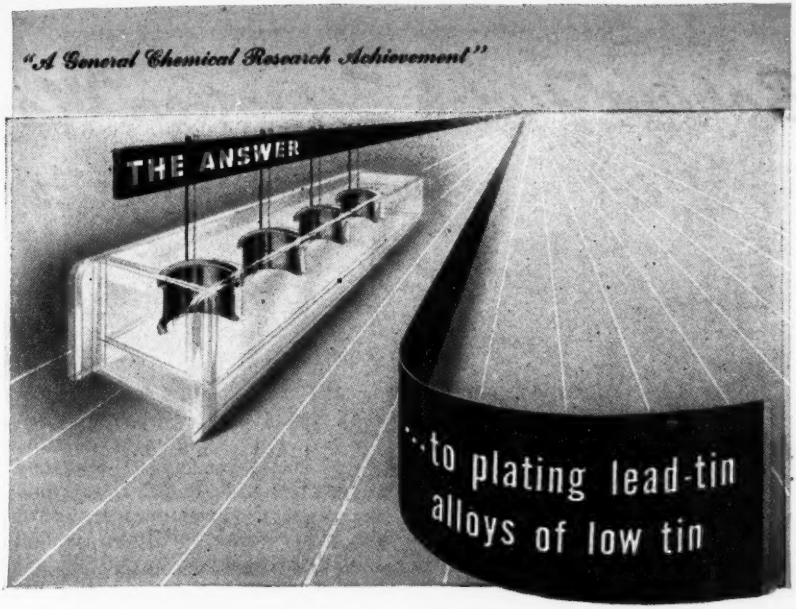
(5) There is a force of attraction between an electrified and an unelectrified body.

(6) Like charges repel each other and unlike attract.

(7) The charge on glass when rubbed with silk and then separated is arbitrarily called positive.

Since we are primarily interested in dynamic or current electricity, in the next article we will continue tracing the evolution of knowledge concerning the lodestone or magnet.

*"A General Chemical Research Achievement"*




**For more** than 25 years metal finishers have sought a successful means of plating lead-tin alloys in the low tin ranges. "Not feasible . . . inoperable . . . too many variables," read published reports on method after method.

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# Baking Finish Situation May Affect Reconversion Plans on Some Products

By BURR PRICE

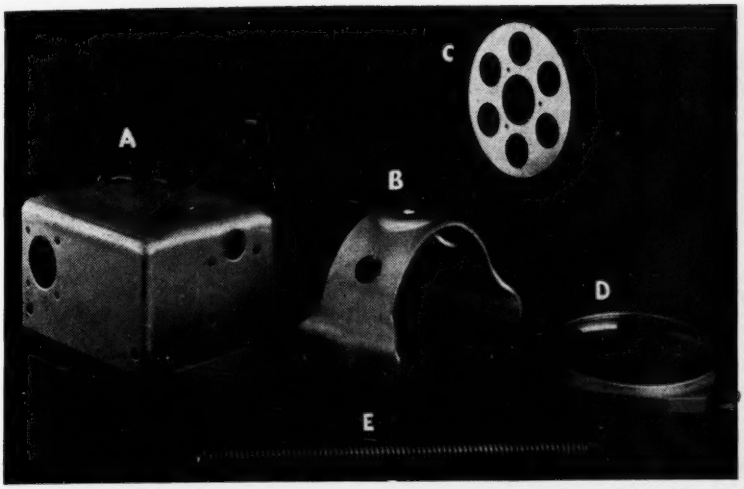
A LIMITED quantity of suitable finish coatings for such products as refrigerators and washing machines is now available, according to WPB advices to the Paint, Varnish and Lacquer Industry Advisory Committee in Washington at the start of July, but the general outlook is none too promising for protective coatings for the product finishing groups, especially those based on phthalic alkyd resins, which continue in an extremely short supply.

WPB has received complaints from a number of producers who have been unable to obtain paint products for highly essential civilian uses, and is studying the problem. Prospects for serious delay in certain fields of civilian production are such that some groups in Washington are urging the channeling of the scarce materials in limited quantities to avoid complete bottlenecks.

Current military requirements are, of course, at the base of the tightness of the phthalic alkyd resins, which will be allocated for use in Pacific zone operations for the rest of 1945. Just how serious the crisis is may be realized from the fact that some demands of the Army, Navy and Maritime Commission for alkyd resin finishes are now being denied and they are being told to find substitute finishes. Some military cutbacks would seem to have a tendency to ease shortages, but despite this and increased production of the phthalic anhydride base, civilian availability will be extremely limited.

WPB has told the Alkyd Resins Advisory Committee that every effort will be made to provide substitute materials and, where alkyd resins are deemed essential, small quantities may be provided for actual scheduled operations. However, these quantities will not permit the filling of large dip tanks or paint pipe lines. The committee in its turn told WPB that it doubted if consumers would readily accept coatings of an inferior quality as compared with alkyd resin coatings used in the pre-war period.

At a late June meeting between WPB and the Paint, Varnish and Lacquer Advisory Committee, industry representatives were told that allotments of raw materials for the refrigerator and washing machine programs will be made only to the extent necessary to finish the total number of units to be produced in July, August and September. Where total requests for raw materials exceed the quantity calculated as necessary, allocations will have to be

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reduced accordingly. Raw materials for these programs can only be made available because of the calculated overall small requirements. Excessive ordering by refrigerator or washing machine manufacturers or inflationary requests by their coating suppliers will result in reductions in allocations.

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**"Labor Saving Chemical Methods for Cleaning, Paint Stripping and Corrosion Removal in the Shipbuilding Industry"** is the title of a four-page bulletin prepared by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif. Copy of Technical Bulletin A-326 free upon request.

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**"Iridite Treatment for Plated Parts"** is the subject of an eight-page reprint now being distributed by Rheem Research Products, Inc., 806 Standard Oil Bldg., Baltimore 2, Md. Written by J. Albin, the article is illustrated with photographs showing a variety of parts that have been Iridite treated to resist corrosion, as well as set-ups for employing the Iridite treatment. Copy free upon request.

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**"Sanding and Finishing"** is the title of a booklet prepared by The Carborundum Co., Niagara Falls, N. Y., containing important information concerning coated abrasive products and their uses. The booklet features data on sanding and finishing processes, abrasive grains, classification of grain sizes, bonding materials, coatings, backing materials, flexing, stocking, identifying and specifying coated abrasive products, as well as recommendations for belt splices, machine specifications for belt sanding, and specifications for standard coated abrasive products. Copy free upon request.

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**Chemistry for Electroplaters.** By C. B. F. Young. Published by The Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. 205 pages. Cloth binding, board covers. Price $4.00.

This book, written in clear and simple language, accumulates from the immense realm of chemistry those theories and definitions which have a bearing on electroplating. Without assuming any previous knowledge of chemistry, it leads the electroplater step by step to the understanding of the principles of chemistry and the chemical phenomena arising in his work in the plant.

The author, who has had considerable experience in teaching chemistry to electroplaters, is well aware of the difficulties the student will have in mastering this subject and succeeds in giving the electroplater the fundamental knowledge and initiative for the solution of his problems.

Particularly useful is the list of questions at the end of each chapter which will serve as an excellent review for the reader to check his comprehension and mastering of the chapter. Comprising the book is a total of 12 chapters, together with an index.

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# Plating of Plastics at Monroe Auto Equipment Company

By BRYANT W. POCOCK

WHEN Adolph Bregman (1) wrote his concise but comprehensive survey of the plating of non-metallic materials in 1941, he little realized that three years later the Monroe Auto Equipment Company of Monroe, Michigan, would be turning out honorable discharge buttons by the hundreds of thousands for the Army, Navy and Marine Corps, made of gold-plated cellulose acetate. When H. Jacobi exhibited samples of metallized articles in 1837, as cited by Bregman, he could not have visualized the beautiful silver and gold Navy insignia that were to be fabricated of plated plastic over a century later.

The Monroe Auto Equipment Company, fifth-time recipient of the Army-Navy E, is exclusively licensed by the Metaplast Corporation to use this company's formulas for metallizing plastics designed for the automotive field, with no restrictions in other fields. With this advantage, the Monroe company has achieved the unique distinction of possessing unusual experience in the plating of plastic materials.

In his 1941 report, Bregman lists five methods of applying metal to a non-metallic base. These are briefly a combination of binder and conducting coat, sprayed metal, cathode sputtering, vacuum deposition and precipitation by chemical reduction of silver salts. The last two of these processes have been used for a num-

Shown above is a group of plastics, including automotive hardware, airplane antenna, religious ornaments, Army and Navy insignia, and Army honorable discharge buttons, plated by Monroe Auto Equipment Company.

ber of years in the manufacture of mirrors. The last one, reduction of silver salts in solution, forms the basis of the Metaplast process.

Engineers at the Monroe Auto Equipment Company are quick to point out that the first requisite for a good plate is a good plastic. A good plastic for plating must be a smooth plastic. Exceedingly minute defects in the smooth surface of a plastic base are magnified tremendously after plating and burnishing. This suggests a second qualification which a good plastic should possess, that of hardness, inasmuch as the duration of smoothness is a direct function of hardness. Plastics which have been found suitable for plating at Monroe include cellulose acetate, cellulose-celluloid, Lucite, Bakelite, polystyrene, phenol-formaldehyde, formaldehyde-urea, laminated wood impregnated with phenols, and so on.

After a plastic material has been selected for plating and parts have been molded by injection or otherwise, the first step in finishing consists of removing any gloss resulting from the molding process. This is done in the case of small parts by tumbling them in barrels with pumice and sawdust. Larger parts receive a light sandblast treatment. The parts are then washed clean and rinsed, after which they are ready for metallizing.

Small parts are metallized at Monroe in special reducing jars of approximately one-gallon capacity. Large parts are spray-bonded. In either case, the process is essentially the same, consisting of the reduction of silver salts in one solution to metallic silver by the action of certain reducing agents in a second solution, with consequent deposition of the silver onto the surface of the plastic. The process is described by Brams (2) as consisting of reduction of silver in the presence of tin and hydrochloric acid. When sprayed, the two metallizing solutions enter and leave the spray gun separately in such a manner that the two streams converge to meet and blend at the proper distance in front of the gun for convenient handling. This distance is quite critical, and blending should occur on or slightly ahead of the surface being metallized. The parts are then thoroughly rinsed and air dried for at least two hours.

After metallizing, small parts, such as the honorable discharge buttons, are barrel plated. Larger parts, such as door handles and automotive trim, are racked and tank plated. Where a stop-off is to be used, it is applied prior to sandblasting. Both rubber masks and stop-off lacquer are used, as well as Industrial Tape Corporation's Permacel tape.

There is no tendency at Monroe to minimize the notion that intri-

(Left) Plastic mounted base for Navy insignia ready to be metallized prior to plating. (Right) Finished Navy insignia silver and gold plated

Fancy dress buttons of plastic before and after plating

cately molded plastic articles can be delicate things and should be handled extremely carefully. Operators are cautioned not to abuse them or to stretch their bond coating. Inasmuch as some plastics are sufficiently soft to be scratched with the fingernail, although possessing other properties which render their use expedient, operators are instructed to handle them "as if they were eggs."

After metallizing, a conducting surface of pure silver has been deposited for subsequent plating. Additional silver may be plated on at once, or copper with or without a nickel flash may be plated as a base coat. High ductility and good throwing power are both required. There is no doubt from experience at Monroe that copper is superior to silver as a base coat. In fact, although originally specifications for honorable discharge buttons required a base coat of silver, these specifications were altered so that copper may be used. Nickel is never employed as a base coat at Monroe other than as a flash, nickel being too brittle for use in greater thicknesses. These flash coatings of nickel are usually of 6 to 8 minutes' duration.

Some plastic articles, notably buttons, are given base coatings of copper alone, which are burnished, followed by gold plating and final burnishing. Turret swivel cases of phenolic plastic for radar equipment are copper plated, the copper is sanded only and the parts plated with cadmium.

Although zinc can be plated with equal facility on plastic or metal, and is plated on plastics by barrel plating elsewhere, the Monroe company does not use zinc at present. Other metals, however, are used at Monroe. United States Navy insignia are plated in silver and gold. The silver on the upper half is buffed to a high luster, and the anchor and chain comprising the lower half are given a color plating of gold. The conventional tripartite

Plastic automobile door handles before and after chromium plating

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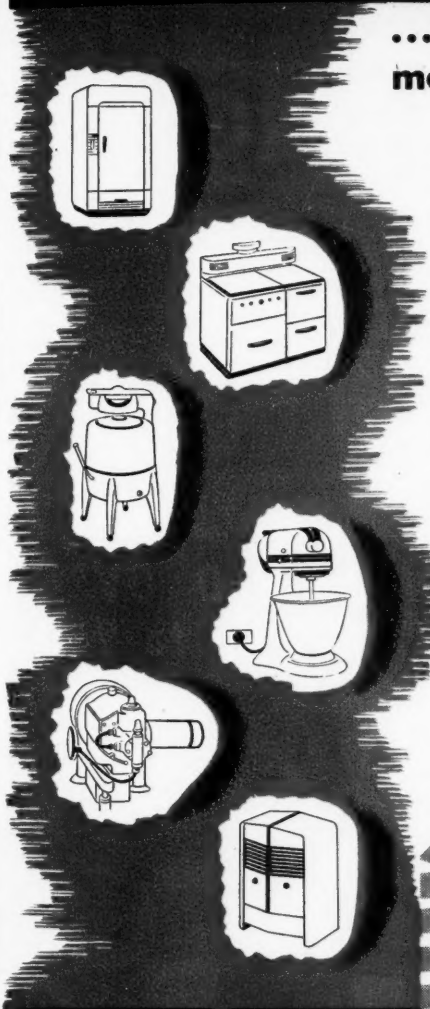

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copper-nickel-chromium plate is used for plastic automotive parts, the acid copper bath being used because of its usual throwing power. Here particularly, heat-resistant plastics are used as base materials due to the large mount of buffing required.

Essentially the same basic principles apply in plating plastics as hold in the plating of metals. It is very much the same thing, actually, for fundamentally there is no such thing as plating a non-conductor electrically. The non-conductor (plastic) must first be transformed into a conductor. But there is a decided difference in the effect of heat, either from the electrolytic bath or from the friction associated with mechanical buffing. It is quite possible that some high-speed production operations of the near future may require special air cooling installations.

The high luster of ornamental electroplated deposits is preserved and protected at Monroe by coatings of clear lacquer, which restrain any potential tendency toward oxidation and resultant tarnishing due to any possible alloying with the base coat.

An interesting application of the plating of non-conductive surfaces was worked out by the Monroe Auto Equipment Company for the armed forces. Airplane antenna masts for radar equipment, and so on, formerly made of metal, were found in service to decompose and snap off at high speeds. From a metallurgical standpoint, the trouble was apparently associated with sympathetic vibrations set up within the metal composing the masts by certain, as yet not fully understood, effects of harmonics produced at speeds approaching that of sound. It was discovered that although metals refused to absorb these shocks undamaged, hard-


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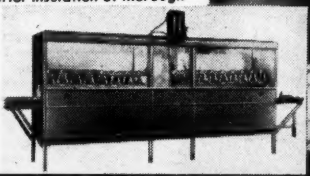

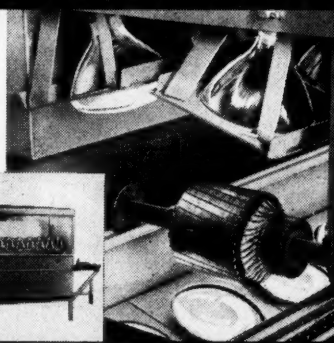

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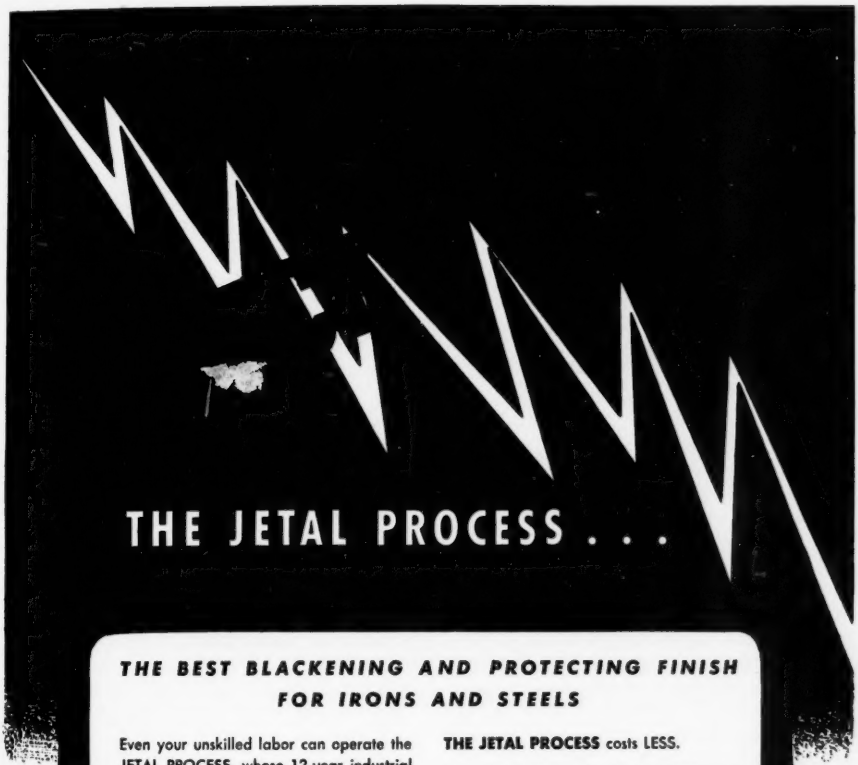

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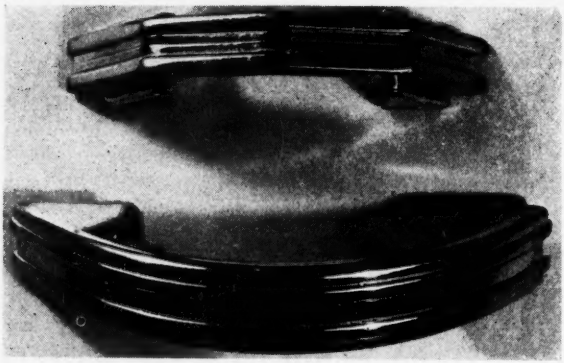
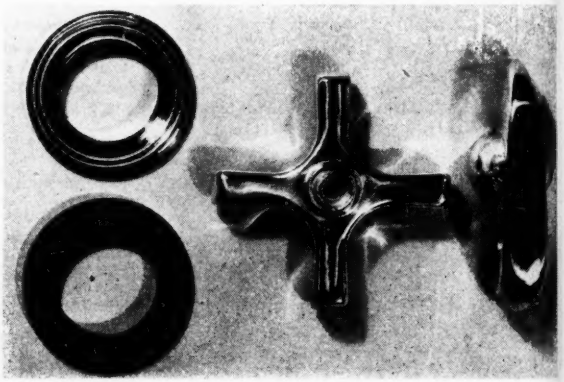


Types of cabinet hardware made of plastic and plated with chromium by Monroe Auto Equipment Company

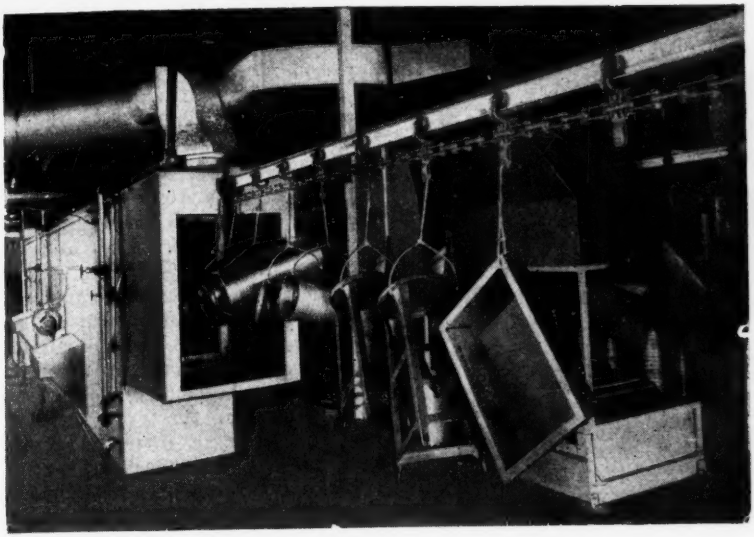
woods were able to do so. Consequently, antenna masts came to be made of hardwood plated at Monroe to 0.015-inch thickness of soft, ductile copper. (Copper deposited from the acid bath Brinnells at about 150, which is approximately equivalent to 81 Rockwell B.) The snapping of antenna masts fell off to nothing but nuisance level henceforth.

In another case, also of application to electronic equipment, the plating of non-conductors solved a problem of considerable practical importance. Originally, the turret swivel cases for radar apparatus were made of light metal. These cases were electrically shielded by still larger cases, offering a combination which worked fine electrically but which soon proved to have two mechanical disadvantages. The first, that of weight, could be alleviated by proper choice of metal and gauge. The second was a more difficult and serious problem, involving the condensation of water from the air. No metal existed which possessed a low enough thermal conduction to make an effective insulator against condensation. Both problems were eventually solved by using Bakelite plated with 0.005 inch of cadmium. The cadmium plate took the place of the outer case formerly used as an electrical shield; no condensation occurred in service, the apparatus was lighter in weight, and a hitherto unrealized objection, that of size, was overcome.

Experience at Monroe corroborates that Bakelite (phenol formaldehyde impregnated with inert filler) has high resistance to heat and hence is a good choice of plastic for plating. Acetates and nitrates, on the contrary, are among the most susceptible



Examples of automotive and plumbing fixtures made of plastic and chromium plated by Monroe Auto Equipment Company



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to higher temperatures and have to be more carefully handled. This is somewhat the case also with plain phenol - formaldehyde - urea plastics. Porous materials must be properly impregnated with resins or other void fillers before plating. Leather, wood and glass are in general excellent materials for plating.

The Monroe Auto Equipment Company has done considerable pioneer work in the fabrication and plating of parts made of synthetic and natural rubbers. Window molding and general automotive trim are among examples of parts which might suitably be made of rubber and chromium plated. Another is channel rubber. All promising types of synthetic rubbers are being investigated in this connection in preparation for an expected surplus of these materials after reconversion to peace-time economy. Unlike the case with most plastics, rubber molding machines must be designed to turn out articles rapidly as rubber deteriorates fast in the unvulcanized state. Inasmuch as no suitable molding machine was available, the Monroe company cooperated with Chrysler Corporation and a machine was designed which the Monroe Auto Equipment Company plans to make commercially available as soon as possible (3, 4). This is believed to be the only universal injection molding machine applicable to rubber, thermosetting and thermoplastic materials alike. It will be manufactured and marketed by the Monroe Auto Equipment Company, probably on a lease basis.

An interesting and highly important fact which must be remembered when dealing with rubber, whether the finished article is to be plated or not, is that although it possesses greater elasticity than any other material known, rubber is for all practical purposes absolutely incompres-

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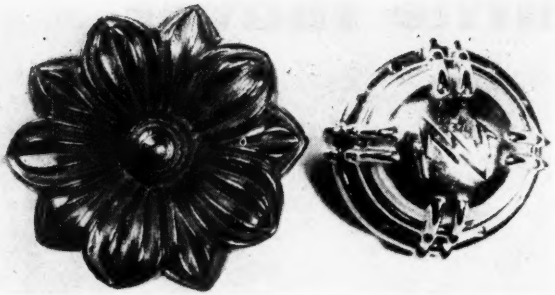

Plastic ornamented rosette and automotive part which have been gold plated and chromium plated respectively

sible. Many persons have been known to remark somewhat facetiously that it is also incomprehensible, but this is becoming less and less true as its internal structure succombs to the unrelenting eyes of researchers everywhere.

The plating of non-conductive surfaces in reality comprises the marriage of metals and plastics. No longer are they to be considered strictly as rivals for the same job. Monroe engineers (5) have determined that plating alleviates cold flow and potential dimensional instability in thermoplastic materials to a considerable degree. In the field of electronics, plating produces the perfect electrical shield. Tensile strengths of phenolic moldings have been increased over 41 per cent by plating. Absorption of water, oils and solvents has been eliminated. Impact strength has been increased. On the other hand, metals are heavy and are costly on a weight basis. They are strong, but so are plastics, some of which rival steel in strength. For many purposes, a combination of the two has proved ideal. The higher machining costs of metals must be contrasted with the relatively cheaper injection molding operations associated with the fabrication of plastic parts.

As pointed out by Brams (2), the electroplater prefers the greater stability of plastics of the thermosetting type as contrasted with that of thermoplastic materials. Brams observes that Lucite, Bakelite, Plaskon, and the butyrates are especially suitable, and that the furfurals are satisfactory. The vinyl group he lists as unsatisfactory, a view which is at variance with that of Narcus (6), probably because of the relatively low softening point (160 deg. F.) of these types.

The Monroe company has had considerable experience in plating all the common metals on most of the synthetic materials which have come out of the chemist's workshop in the past few years. These metals include tin, silver, gold, nickel, cadmium, zinc, copper, and chromium. This company could also deposit rhodium, lead, and palladium on plastics if desired.

Lightness, strength, beauty and endurance are outstanding qualities of plastic parts plated by the Monroe Auto Equipment Company. These qualities were not attained, however, without the employment of considerable research and engineering know-how. Many difficult "bugs" had to be eliminated and many temporary blind alleys conquered. For example, as related by Raymond R. Dickey (5), honorable discharge buttons are molded of cellulose acetate, and silver cyanide attacks acetate. The silver cyanide solution originally specified had to be adjusted, along with the current passing through it, in such a manner that silver was plated on before the cyanide had a chance to at-

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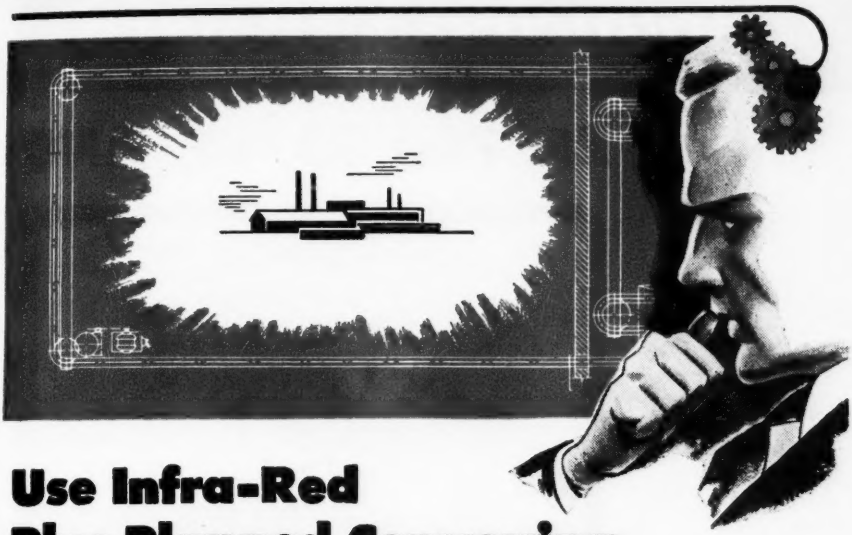

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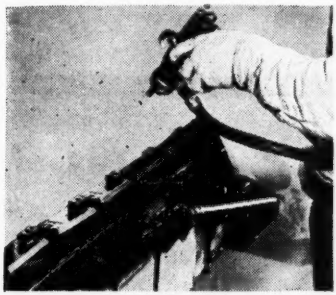

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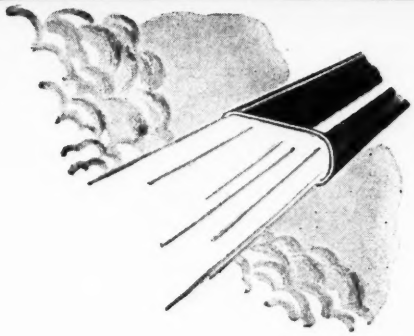

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tack the acetate base. During first quarter-hour of barrel plating, the buttons had to be watched continually to assure the development of even, smooth coatings. After the 0.003-inch silver plate, they had to be burnished with steel shot and burnishing fluid in tumbling barrels in order to obtain the desired gold "gleam" on the finished buttons. Most of these processing difficulties disappeared after the specifications were altered to allow use of copper as a base coat. Dickey estimated that a total of 16 cents worth of gold is plated on every dozen buttons, which gives an idea to the close tolerance to which this one item must be held. At peak production, 50,000 individual buttons were plated, packed, and shipped daily.

The Naval insignia are masterpieces of craftsmanship and beauty. Whereas the honorable discharge buttons are for the most part formed in two-piece molds, the front and back being welded together with acetone, the Naval insignia are in reality two separate parts even when finished. The two halves are bolted together, the plastic bolt being part of the upper half. The lustrous silver and gold finish of this striking emblem makes of it an outstanding model of elegance. Here again, however, practical engineering insight entered into the story of its development. It is a lot easier to plate one half of an object silver and the other half gold when the two halves are separated than it is to use a stop-off and try to keep the halves together.

Refrigerator and automotive door handles, exquisitely designed and finished in bright chromium plate at Monroe, would seem at first appearance to be of die-cast base. On picking them up, however, the difference is immediately apparent. They are as light as wood, and strong enough for their purpose. Plastic plumbing fixtures, light, strong and chrome plated, knobs for automobile gear shift levers, and handles for cabinet doors vie with fancy dress buttons of unusual design, crucifixes, medallions, and bottle closures for interesting and valuable applications of the electroplating of plastics at Monroe.

The serious worker in the field of metal coatings for plastics would do well to familiarize himself with Bregman's excellent summary. That author gives practical working formulas for all the important stages in the plating of non-conductors including a step-by-step method of metallizing by silver reduction. He points out that it is unnecssary to use a reducer for silver deposition when metallizing Bakelite, since the formaldehyde contained in this plastic constitutes an automatic reducing


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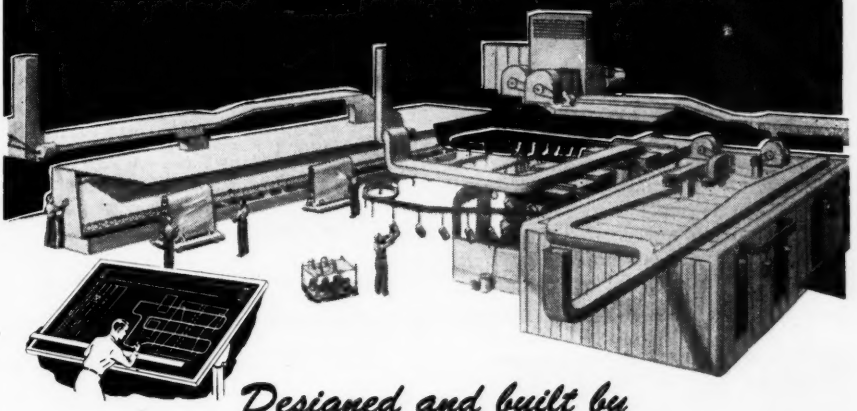

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agent. He gives directions for plating such extremely delicate substances as flowers, insects, and other fragile biological tissues. He discusses the plating of leather and glass. He stresses the importance of sealing the surfaces of porous materials, the necessity for which is heartily endorsed by the Monroe engineers.

To quote from the engineer in charge of the Monroe Auto Equipment Company's Rubber Division, the present state of the art of plating plastics is such that prospects for the immediate future are practically unlimited. About the only improvement of any great consequence which remains as yet undiscovered is the development of a plated metallic coating as elastic as rubber. Everything so far tends to point in the direction of a tremendous postwar demand for the electrodeposition of metals on plastics and allied substances for ornamental and utilitarian purposes. Quite literally, the sky appears to be the limit.

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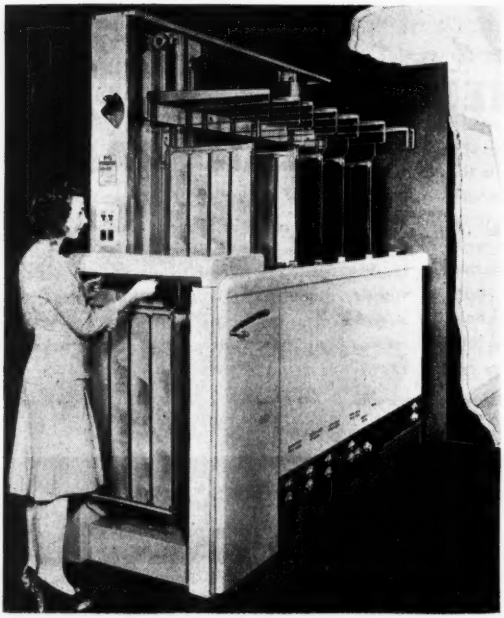
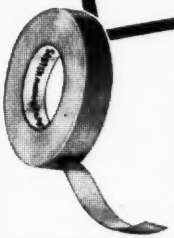


TO protect the tanks and splash boards of X-ray developing machines, Pako Corporation coats them with a protective finish based on Vinylite resins, which is known as Sterilkote and is marketed by Bradley & Vrooman Company. Before applying this finish to its line of X-ray processing equipment, Pako tested Vinylite plastic coated steel for ten months with various photographic solutions. Results were promising and led to the specification of the coating as a protective finish for all splash panels and structural members. The plastic surface has been found to provide a continuous protective coat that withstands the constant attack of the solutions used and washes clean from stains with no change in efficiency.

The illustration shows a Pako X-Ray Filmachine placing hangettes in feeding magazine.

*(Photo Courtesy Bakelite Corporation)*



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# Electroforming
## Suggested Technique

By SAMUEL WEIN

ELECTROFORMING is that specific method or process in which metal is electrolytically deposited on a suitable mold. There are several known or distinct methods commonly employed in electroforming, two of which are as follows:

1. A wax casting is made from the original mold, and the wax mold is made electrically conductive by means of (a) graphite or (b) silvering methods.
2. Lead or fusible alloys are used to form the duplicate from the original. Lead and fusible alloys are used primarily because they have a better electrical conductivity then prepared wax castings and, in addition, metallic impressions hold their physical shape considerably better than wax impressions, thus obviating further handling, and so on.

Lead duplicates necessitate the use of hydraulic presses to allow for production from originals. Fusible metals are ideal primarily because they can be melted at low temperatures, for example 255 deg. F., and can be cast against the original with exactitude and with no equipment other than an ordinary pot to melt the alloy and a ladle with which to pour it against the original form. Such an alloy is commercially available under the trade name of "Cerrobase" and is made up of 55.5 parts lead and 44.5 parts bismuth.

Once a casting has been made of Cerrobase, it can be plated to a desirable thickness with copper, iron, and so on, and the fusible alloy melted out. Such an electroformed shell may be backed up on the reverse side with lead-antimony alloy or "sweated" onto a brass, iron, or steel plate, forming a mold for compression, injection, or other methods of forming plastics.

A difficulty experienced with electroforming metals against Cerrobase is the "tinning" effect between the two metals, with the result that it is sometimes difficult to obtain a clean surface. To obviate this tinning effect between the Cerrobase form and the electroformed shell, a preliminary treatment has been found to provide clean surfaces and for ease of separation between the shell and the alloy form. The following is a series of electroforming methods used and suggested by the author in the production of molds.

Use the Cerrobase casting as an anode in a 3 per cent solution of sul-

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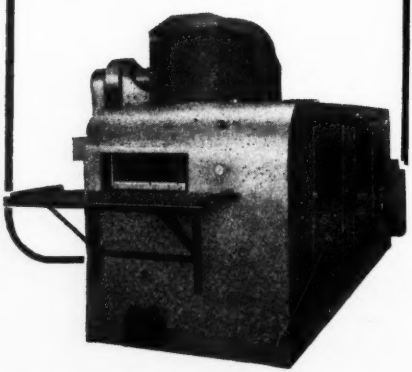

phuric acid at room temperature. The current density should be between 14 and 15 amperes per square foot of anode surface. The time of anodic treatment required has been found to be between 5 and 10 minutes. (A little experimenting with the time period will soon reveal the specific timing.) After the anodic treatment, the casting should be washed with hot water and dried. Next, dip the casting in a mixture of S.A.E. 10 motor oil and 3 parts naphtha, drain for 5 minutes, remove any drops of oil mixture carefully with blotting paper, and allow the naphtha to evaporate. Usually, the anodic treatment will clean the Cerrobase casting properly. Several dips in naphtha prior to anodic treatment should be employed where the Cerrobase casting is dirty. Now plate the casting with copper using an acid copper bath.

A second method of electroforming which has afforded good results as far as separation is concerned but tends to give a matte finish to the casting consists of (1) cleaning the Cerrobase casting in naphtha and drying with a clean cloth without touching with the bare hands; (2) dipping the casting in a thin paste of clear nitrocellulose lacquer into which lamp black or graphite has been stirred; (3) allowing the lacquer to drain from the casting and drying; (4) electroplating with copper from an acid copper bath.

A third method suggested involves the application of a thin coating of a medium grade of graphite grease to the casting. However, considerable experience is required in order to obtain consistently good results with the grease method.

---

★ ★ ★

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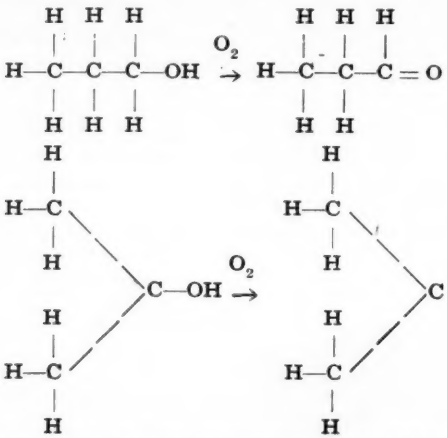
# Organic Chemistry

By C. B. F. Young, Ph.D.

## Part 3

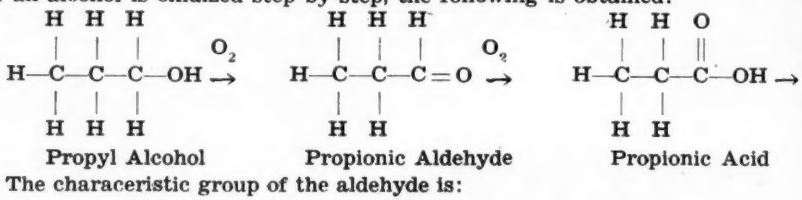
IF alcohols are partially oxidized a group of interesting compounds results. Thus, if n-propyl alcohol and secondary propyl alcohol are oxidized, the following takes place:




An Aldehyde (Propionic Aldehyde)

A Ketone (Acetone or Dimethyl Ketone)

Aldehydes are an intermediate group situated between the alcohols and acids. If an alcohol is oxidized step by step, the following is obtained:

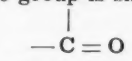



Propyl Alcohol — Propionic Aldehyde — Propionic Acid

The characeristic group of the aldehyde is:

It will be noted that there is a double bonded oxygen and a hydrogen attached to the same carbon, leaving one free valence.

Ketones are similar materials but they do not have a hydrogen atom attached to the carbon. The characeristic group is shown below:

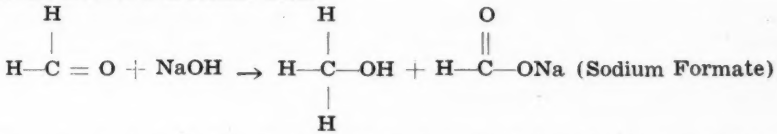


Here is a double bonded oxygen attached to a carbon leaving two free valences which are attached to other carbon atoms. The ketones will be discussed in detail later.

The simplest aldehyde is methanal or formaldehyde, H—C = O, and is made by oxidizing methyl alcohol at high temperatures with air using copper as a catalyst. This product has a low boiling point,—21 deg. C., and for that reason is not sold as a liquid. It is, however, dissolved in water and sold as a 40 per cent solution known as Formalin.

Formaldehyde will polymerize and form higher molecular weight materials. If pure formaldehyde is allowed to stand at its boiling point, it forms a material known at trixymethylene, $C_3H_6O_3$. If a water solution of formaldehyde is evaporated, a high molecular weight compound known as paraformaldehyde is produced, which has different properties from the above.

Formalydehyde undergoes many reactions which are not characteristic of the aldehyes. The material unites with caustic soda or sodium hydroxide to form an alcohol and formic acid:



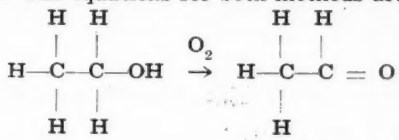
If ammonia is added to formaldehyde, hexamethylene tetramine is formed. This product is used as a rubber accelerator.

$$4\ NH_3 + 6\ CH_2O \rightarrow (CH_2)_6\ N_4 + 6H_2O$$

If phenol or similar materials are added to formaldehyde, resinous products are produced which with subsequent treatment can be made hard, tough, and resistant to acid, alkali solutions, and solvents. The original (phenol and formaldehyde) condensation product is known as Bakelite which is a well known plastic. Similar plastics can be made using formaldehyde and casein, and so on.

Acetaldehyde does not have the germicidal properties of formaldehyde, neither does it produce plastics when mixed with phenol, and so on. The material is made by the oxidation of ethyl alcohol and also from acetylene. The latter gas is dissolved in sulfuric acid in the presence of a catalyst such as a mercury salt. The product obtained is hydrolysed and after splitting off water, acetaldehyde is formed. The equations for both methods are given below:

1.

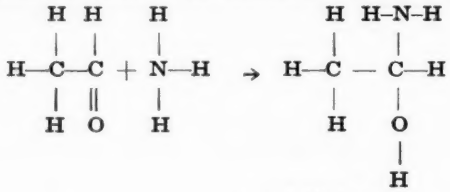


Acetaldehyde

2. $CH \equiv CH \xrightarrow[H_2SO_4]{Hg.\ ++} CH_2 = CHOH \rightarrow CH_3{-}\overset{H}{\overset{|}{C}} = O$

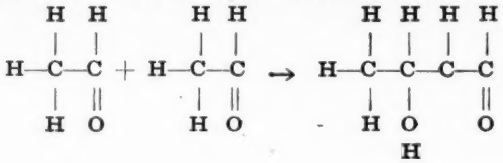
Acetylene — Vinyl Alcohol — Acetaldehyde

Acetaldehyde reacts with ammonia to form an unstable addition compound.



Acetaldehyde Ammonia

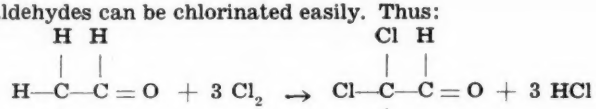
Two molecules of acetaldehyde will combine to form aldol (aldehyde-alcohol).



Aldol

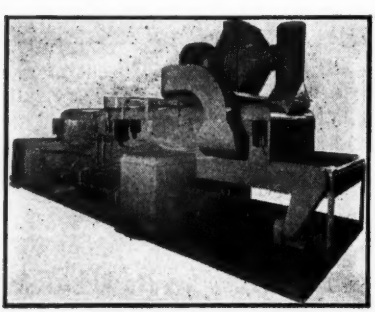
This is known as an aldol condensation and in this way carbon atoms may be added to each other, thereby increasing the number of carbon atoms in a compound.

The aldehydes can be chlorinated easily. Thus:



Trichloracetaldehyde

Aldehydes can be hydrogenated easily, thereby forming again the corresponding alcohol.

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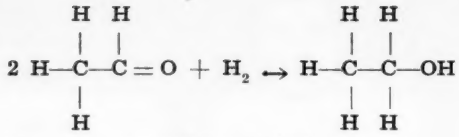
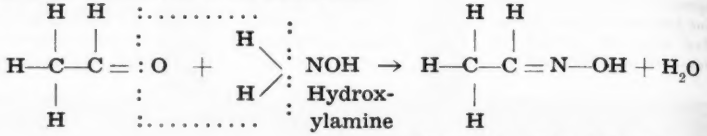
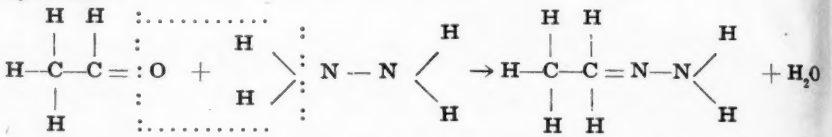


Oxygen can be removed from aldehydes.



Oxime of Acetalydehyde
(An Aldoxime)

Aldehydes react readily with other compounds such as hydroxylamine and hydrazine.



Hydrazone of Acetaldehyde

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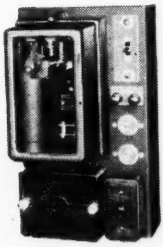
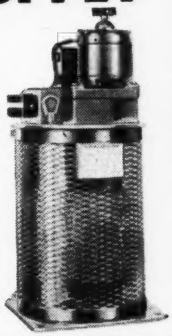
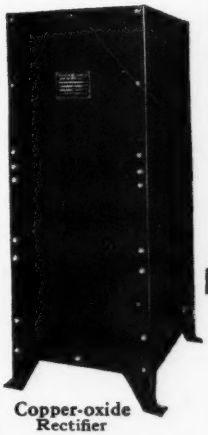


Control Panel



Automatic Control



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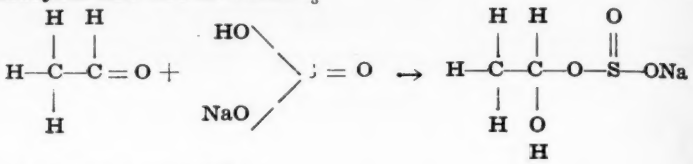
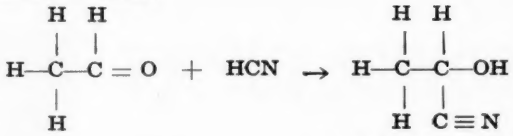
The aldehydes also add on $NaHSO_3$.

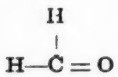
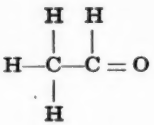
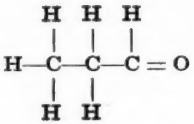
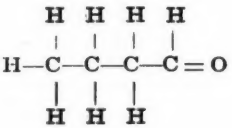
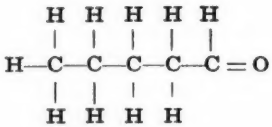


Aldehydes also add on HCN.



Acetaldehyde Cyanohydrin

A large number of aldehydes are known. Some are listed below with their boiling points:

| | | B. P. °C. |
|---|---|---|
| Formaldehyde |  | —21.0 |
| Acetaldehyde |  | 20.8 |
| Propionic Aldehyde |  | 48.8 |
| n–Butyric Aldehyde |  | 74.0 |
| n–Valeric Aldehyde |  | 103.4 |

**Ketones**

If secondary alcohols are oxidized, ketones are produced as has been shown. Thus:

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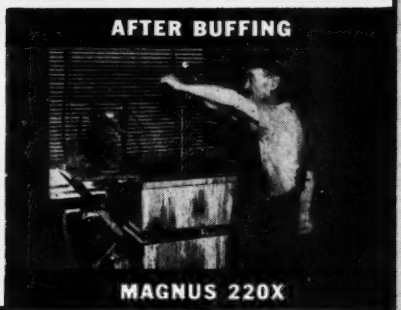


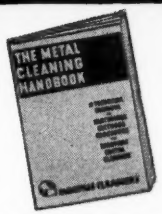


Write for your copy of the Magnus Metal Cleaning Handbook—the complete manual on metal cleaning methods, materials and machines. When you've read it, then ask us to recommend the method and the cleaner best adapted to your work.

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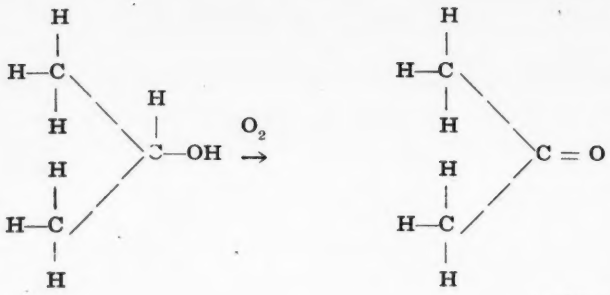

Acetone

All ketones contain the carboxyl group $-\overset{|}{C}=O$. Aldehydes and ketones are similar in many respects in chemical reactions. There is one big difference and that is the ease of oxidizing of ketones to acids. This reaction goes easily in the case of the aldehydes. This can be readily seen if one analyzes the structures. In order to have an acid we must have the group $-\overset{O}{\overset{\|}{C}}OH$. This can be obtained easily in the case of the aldehydes because a —C—H linkage is only affected.

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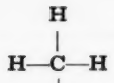
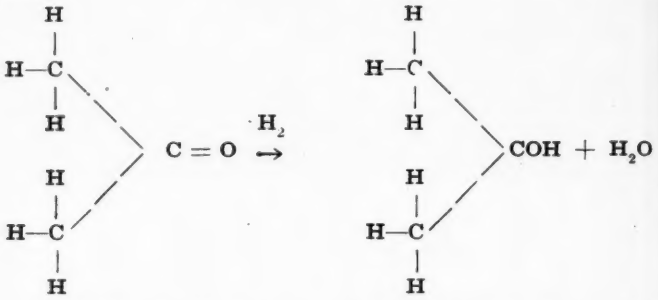
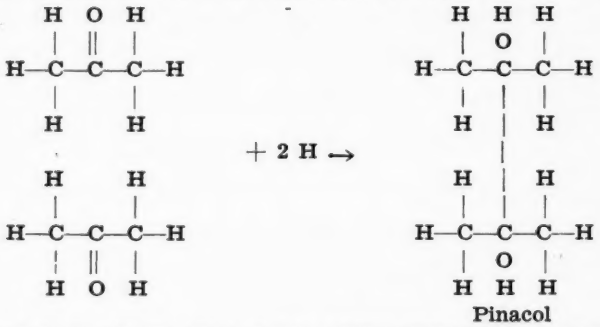


In the case of a ketone we have C = O and a C—C linkage must be broken.

Ketones may be reduced using hydrogen in the presence of copper or nickel catalyst. Thus:



In some cases dialcohols known as pinacols are found as shown below:



Pinacol

Ketones act similar to the aldehydes in adding HCN, $NaHSO_3$ and $H_2N$—OH. Thus: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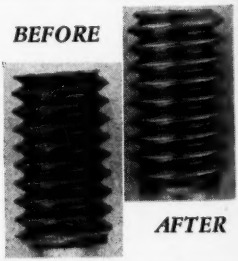

*AFTER*

What does it signify that one of every ten Pratt & Lambert employes gives his full time to laboratory work on paints, varnishes and lacquers?

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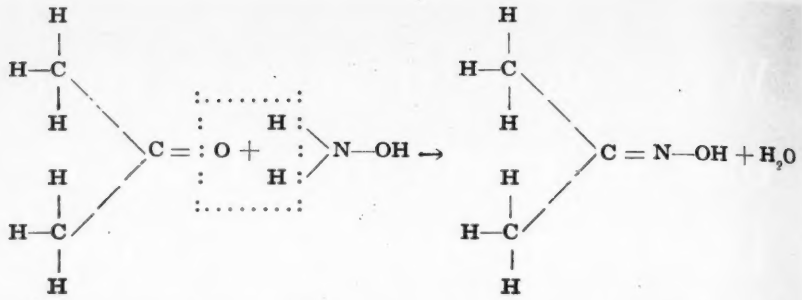
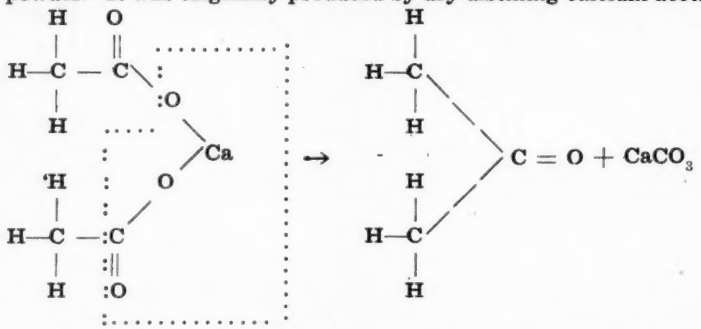
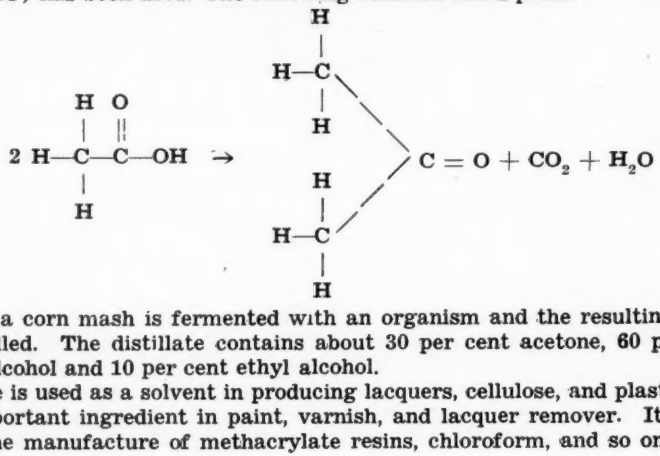


By far the most important ketone is acetone. This material became very important during the first World War as a solvent in manufacturing smokeless powder. It was originally produced by dry distilling calcium acetate. Thus:



During the first World War, it was made from glacial acetic acid. This material was passed over a catalyst, heated lime, and magnesia. Later manganous oxide (MnO) has been used. The following reaction takes place.

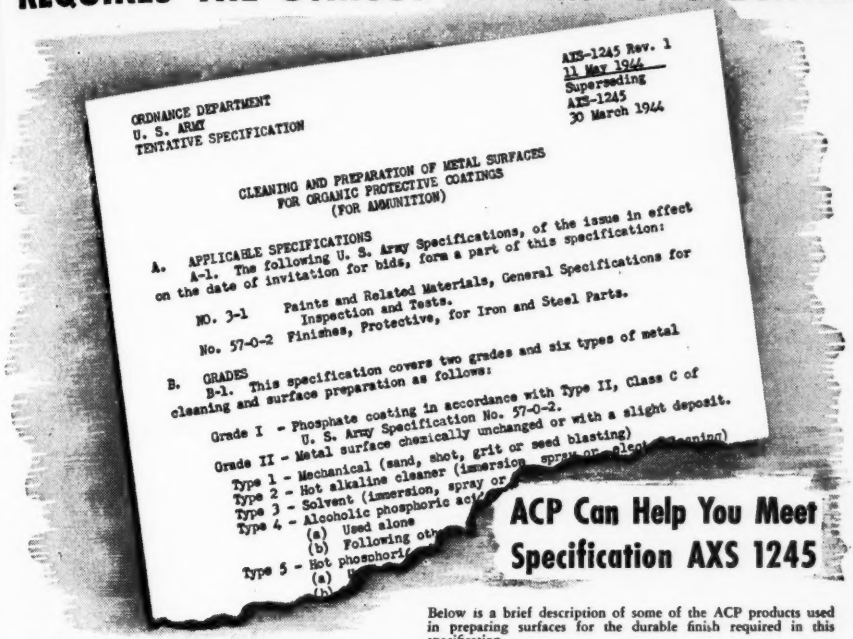


Lately, a corn mash is fermented with an organism and the resulting products distilled. The distillate contains about 30 per cent acetone, 60 per cent n–butyl alcohol and 10 per cent ethyl alcohol.

Acetone is used as a solvent in producing lacquers, cellulose, and plastics and as an important ingredient in paint, varnish, and lacquer remover. It is also used in the manufacture of methacrylate resins, chloroform, and so on.

# WAR IN THE TROPICS

## REQUIRES THE UTMOST IN PAINT PROTECTION


ORDNANCE DEPARTMENT
U. S. ARMY
TENTATIVE SPECIFICATION
AXS-1245 Rev. 1
11 May 1944
Superseding
AXS-1245
30 March 1944
CLEANING AND PREPARATION OF METAL SURFACES
FOR ORGANIC PROTECTIVE COATINGS
(FOR AMMUNITION)
A. APPLICABLE SPECIFICATIONS
A-1. The following U. S. Army Specifications, of the issue in effect on the date of invitation for bids, form a part of this specification:
No. 3-1 Paints and Related Materials, General Specifications for Inspection and Tests.
No. 57-0-2 Finishes, Protective, for Iron and Steel Parts.
B. GRADES
B-1. This specification covers two grades and six types of metal cleaning and surface preparation as follows:
Grade I - Phosphate coating in accordance with Type II, Class C of U. S. Army Specification No. 57-0-2.
Grade II - Metal surface chemically unchanged or with a slight deposit.
Type 1 - Mechanical (sand, shot, grit or seed blasting)
Type 2 - Hot alkaline cleaner (immersion, spray or
Type 3 - Solvent (immersion, spray or
Type 4 - Alcoholic phosphoric acid
(a) Used alone
(b) Following oth
Type 5 - Hot phosphori
(a)
(b)

**ACP Can Help You Meet Specification AXS 1245**

Our Technicians will be glad to assist you in adapting ACP products to meet Government Specification for metal cleaning and surface preparation for organic protective coatings. It is usually possible to adapt ACP products and methods of application to utilize your present equipment, thereby obviating delay and expense of new installations.

The experience of our technicians has enabled them to aid many manufacturers in overcoming serious difficulties in cleaning and conditioning ordnance as well as products for civilian use.

Below is a brief description of some of the ACP products used in preparing surfaces for the durable finish required in this specification.

DEOXIDINES—There are various grades and methods of application suited to the removal of varying amounts of rust and adapted to the different types of equipment in use.

DEOXYLYTE—For suitably adjusting the pH of rinse baths, properly, prior to painting.

RIDOSOL—An addition agent for improving detergent properties in emulsion cleaning.

PEROLINE—For preserving surfaces, in storage or transit, prepared properly for painting.

SOLVENT No. 3—Speeds stripping operations of paint, lacquer and enamel, in strong caustic baths.

RODINE—For inhibiting pickling acids.

Further information and technical data sheets will be forwarded on any of the above products. Address Dept. A-8.

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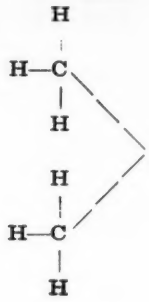
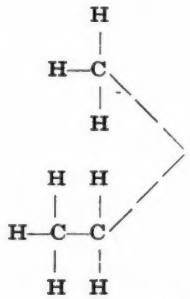
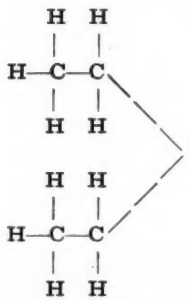
*Eastern Ontario and Quebec*
Van Camp Products & Sales Co.
177 Parliament St., Toronto, Ont.

As one can readily see there are a large number of ketones. There may be simple ketones such as dimethyl, diethyl, dipropyl ketone or mixtures of these such as methyl ethyl ketone, ethyl propyl ketone, and so on. Below are a few ketones with their boiling points:

| Name | Formula | Type | B.P.°C. |
|---|---|---|---|
| Acetone |  | Simple | 56.5 |
| Methyl ethyl ketone |  | Mixed | 80.6 |
| Diethyl ketone |  | Simple | 105 |

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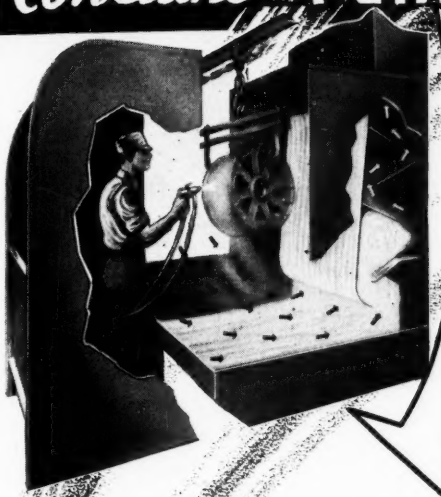

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Heavy welded construction.

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by a *distinct departure* from the conventional design, combined with the proved advantages of wet precipitation, answers your problem of precipitating paint particles from the overspray in paint spraying operations.

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745

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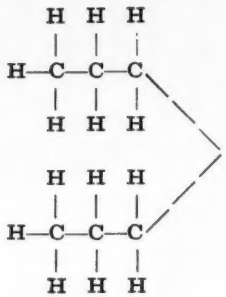
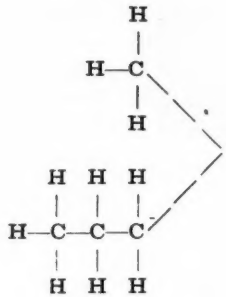
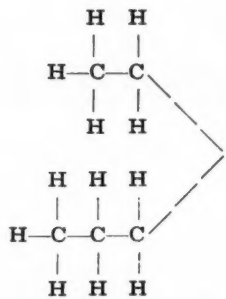
HYDRO-WHIRL DUST COLLECTORS AND SPRAY BOOTHS—INDUSTRIAL OVENS, WASHERS AND VENTILATING SYSTEMS



Dipropyl ketone — Simple — 144



Methyl propyl ketone — Mixed — 102

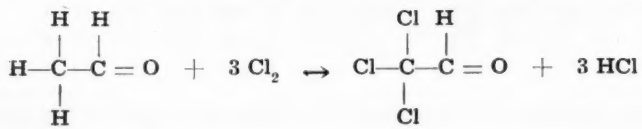


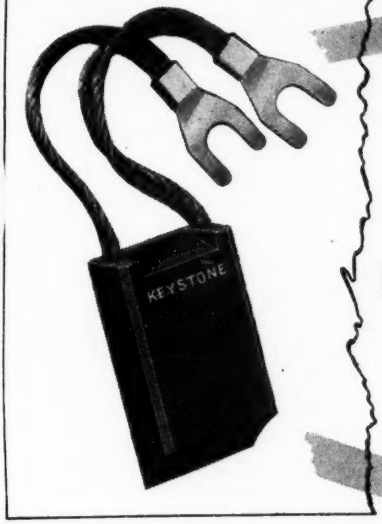
Ethyl propyl ketone — Mixed — 123

As one can see there are many such ketones. It should be noted that no isomers have been given.

The typical reactions of the aldehydes and ketones can be broken down into four groups. These should be kept in mind as this division of organic chemistry is important due to the reactivity of the materials. These groups are as follows:

1. Halogenation or the reaction of chlorine with aldehydes and ketones.



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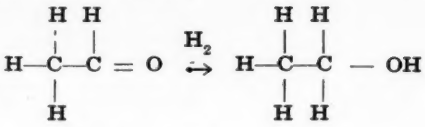
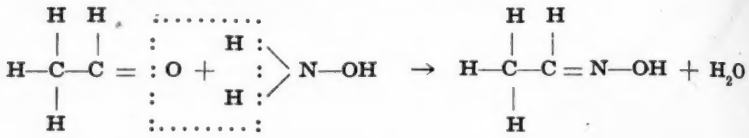
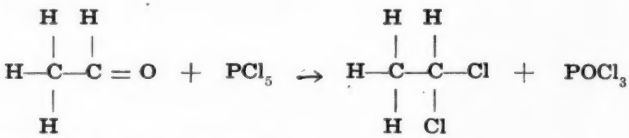
2. Combining with the C = O group.



3. a. Removing the oxygen from the C = O group.

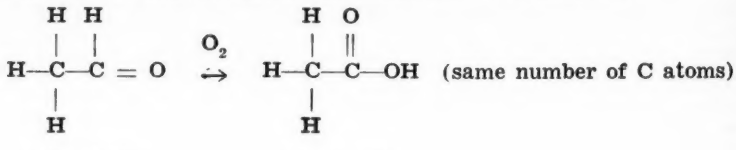


b.

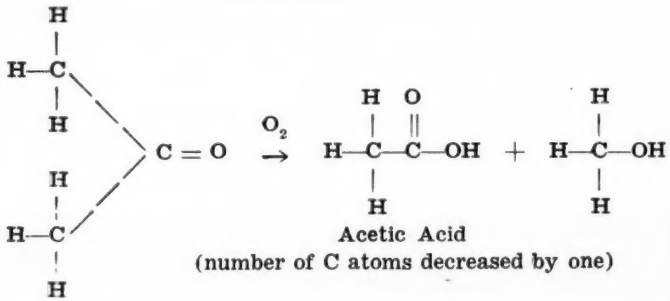


4. The oxidation of the C = O group.

Here the reactions of the aldehydes differ from the ketones. The former are easily oxidized and retain the same number of carbon atoms. The ketones are very hard to oxide and if oxidization does take place, generally the number of carbon atoms in the chain is decreased. In fact, the difference in ease of oxidation of aldehydes and ketones is used many times to distinguish the materials. Simple ketones do not give the silver mirror test. For instance:



Acetaldehye Acetic Acid



Acetic Acid

(number of C atoms decreased by one)

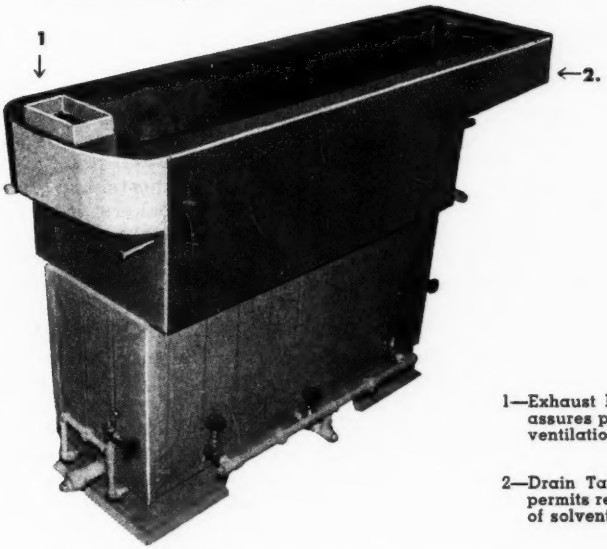
The author would like to thank Mr. W. Jordan Withrow of The City College, New York, for checking the manuscript.

*(To be continued.)*

# 3 DIP
# D'OILER Solvent Degreaser

## Boiling Solvent - Warm Solvent - Vapor Rinse

## CLEANS RADAR PARTS PERFECTLY




1—Exhaust Duct assures proper ventilation.

2—Drain Table permits recovery of solvent.

The unique and proven design engineered into every D'Oiler Solvent Degreaser is successfully serving leading manufacturers of precision radar parts. A typical installation such as pictured incorporates a complete fume exhaust duct as standard equipment. This feature assures proper ventilation for the operator. The built-in drain table provides adequate drainage and promotes important saving of solvent. All-around insulation cuts heat losses to minimum thus, contributing further to economical operation.

It will pay to investigate the D'OILER factors of high operating efficiency and low cost on your peacetime production. Investigate NOW!

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# New York Paint Technologists Take "Post-Grad" Courses in Specialized Finishes

A UNIQUE June "graduation" ceremony—one which should mean much to the products finishing field—was that held at New York University (June 14) when 82 men and women of the paint, varnish and lacquer plants in the New York Metropolitan area received certificates on completion of their courses in fundamental technology and specialized production finishes, sponsored by the United States Office of Education in cooperation with the New York Paint, Varnish and Lacquer Association. Forty-six took the first course, which had for its purpose the upgrading of junior technicians for laboratory, research and production control work, and 36 were in the second course, which was to upgrade technicians for advanced laboratory, plant or service work. Classes were also held at the Newark (N. J.) College of Engineering, where the graduates received their certificates July 7.

Such interest was manifest by the adult students, such were the results obtained, that plans are being perfected for a continuation of the courses by the paint industry in an expanded program which contemplates inclusion of supervisors and foremen of factories in the area using specialized product finishes. Furtherance of engineering and technical developments in the protective coatings establishments and advancement of service to industrial plants are the objectives sought.

Included was a testimonial dinner for the New York graduates given by the companies for which they worked, with top-flight executives acting as hosts and a round of industry speakers introduced by the toastmaster, Assistant Dean Henry J. Mason of the University. Postwar developments, opportunities and competition were the several themes. Ed. H. Bucy, now president of the New York Paint, Varnish and Lacquer Association, urged the importance of greater technical ability in meeting the keen competition which he foresaw from other industries, and Renshaw Smith, Jr., who was president when the courses started, declared that by proper technical training the industry's sales could be maintained at a peak level.

Dr. Henry A. Gardner, director of the Scientific Section of the National Paint, Varnish and Lacquer Association, revealed his belief that new raw materials, such as resins, oils and pigments, must be developed if the industry is to attain its logical growth, because there will not be enough linseed oil, rosin and titanium to supply a doubled volume of production. A new resin, he said, may be developed from the creosote bush which will serve as a substitute for rosin in the manufacture of synthetic rubber, and thus ease the sup-

# SILCO

## GLASS-BASE

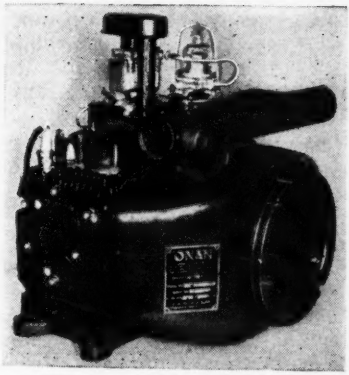
*SPRAYED-ON*

**PROTECTIVE COATING FOR STEEL *and* BRASS**

SILCO is highly resistant to corrosion and abrasion. It withstands heat up to 1000° F. Comes in two pleasing eggshell surfaces and in *all colors*! Easy to work. Bakes at medium temperatures in any industrial oven.

***Ideal for***

**MUFFLERS**
**EXHAUST PIPES**
**STOVES AND HEATERS**
**MARINE HARDWARE**
**STEEL SASH**
**STRIP-HEATERS**
**STEEL FILING CASES**
**FAN BLADES**
**OVEN LININGS**
**RADIO CASES**
**BIOLOGICAL INCUBATORS**



Muffler and Exhaust Pipe Finished with SILCO, Greatly Lengthening the Service Life of the Installation.

and for an infinite number of other products — making SILCO an important addition to any products finishing department. Non-priority. Sample on request.

# BLACK MAGIC

## ONE-BATH OXIDE BLACK

For all steels except stainless. Goes on fast. May be formed after processing. Effective rust inhibitor, excellent bond for paints and lacquers. Simple operation. Chemical reaction at 300° F. Non-priority. Ordnance approved.

There are also BLACK-MAGIC baths for zinc, copper, brass cadmium. The "Black Book" tells all. Send for it.

**BLACK-MAGIC BLACKING SALTS for STEEL, IRON COPPER, ZINC CADMIUM**

•

**WITCH-DIP WITCH-OIL FINAL FINISHES**

•

**SILCO PROTECTIVE COATING**

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**Cleaners Wetting Agents Acid Inhibitors Heat Treating Salts**

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# MITCHELL-BRADFORD

## CHEMICAL COMPANY

## MODERN METAL FINISHES

**2446 D Main St., Stratford P. O., BRIDGEPORT, CONN.**

**CHICAGO OFFICE: 111 W. Jackson Blvd. — DETROIT: June & Co. — CLEVELAND: Universal Paint & Varnish Co. — ST. LOUIS: G. S. Robins & Co. — INDIANAPOLIS: Stovall Equipment Co. — OAKLAND, CALIF.: Geo. A. Kushman.**

ply for the paint industry; and a valuable new oil may be obtained from the seeds of the rubber tree, which will be probably as useful as linseed oil.

Other speakers included Myron Coler, New York University, who conducted the classes in paint technology; Professor F. W. Bauder, of the Newark College of Engineering; E. H. Shakespeare, who conducted the New Jersey courses; Dr. Maximilian Toch; Dr. J. J. Mattiello, Robert V. Kirk; and Richard Skolnick of Central Paint and Varnish Company, representing the student body.

The technical experts who lectured before the classes were Carl W. Patton, Bakelite Corporation; J. R. Yeager, A. R. Olsen and J. M. Schantz, Hercules Powder Company; Dr. J. J. Mattiello, D. I. Razzano and P. L. Jacobson, Hilo Varnish Corporation; K. V. McCullough, Bakelite Corporation; H. F. Payne, American Cyanamid and Chemical Company; W. G. Armstrong and A. E. Kromer, E. I. du Pont de Nemours & Co.; and E. W. Sinclaire, Breinig Brothers.

---

**Kellerflex Flexible Shaft Machines and Accessories** are the subject of a 48-page catalog published by Pratt & Whitney, Division Niles-Bement-Pond Co., Kellerflex Sales Dept., West Hartford 1, Conn. Besides details on the different Kellerflex models and their applications, the catalog contains pictures and descriptions of the various handpieces and attachments and illustrates some of the hundreds of accessories available and how they are used, including wire brushes, burs, felt polishing wheels, mounted grinding points and wheels, sanding discs and so on. Copy free to mechanical executives addressing requests on their company letterheads.

---

*Buy War Bonds and Stamps*

"ROBINSON'S ASSAYED"

**Gold Plating Solutions**

*Are Nationally Endorsed*

MADE BY **A. Robinson & Son**
131 CANAL ST. NEW YORK

# Flock

## gave us the answer we needed!

Designers working on new or old products often find a surprisingly simple solution to a tricky problem, by coating the surface with flock. Flock consists of finely cut textile fibers, and can produce many effects from suede leather to upholstery fabrics. Its many attractive colors commend it for decorative work. Give us an inkling of your problem—maybe we can help. Samples, prices gladly sent.

**FUNCTIONAL**

Used in airplane, auto and numerous other industries for—

**SOUND DEADENING • TEMPERATURE INSULATION • INTEGRAL GASKETS • SHOCK ABSORBING SURFACE • NON-MAR SURFACE PROTECTION.**

**DECORATIVE**

Applied in various lengths and colors to wood, paper, cloth, metal, etc., the following effects are produced—

**SUEDE LEATHER • FURNITURE UPHOLSTERY FABRICS • AIRPLANE AND AUTO UPHOLSTERY FABRICS • VELVET • VELOUR • MOHAIR.**

## RAYON PROCESSING CO. of R.I. INC.

**65 TREMONT ST., CENTRAL FALLS, RHODE ISLAND**

*Developers and Manufacturers of Printing and Coating Flock*

# News of the Industry

## Two New Sales Managers Appointed

According to an announcement by George H. Haplin, vice president and general sales manager, Minnesota Mining and Manufacturing Company,

W. J. Streicher

Robert R. Miller has been promoted to sales manager, industrial trades, and W. J. Streicher to sales manager, distributor trades, in the Cincinnati territory.

Mr. Streicher, a salesman in the Indiana territory at the time of his promotion, has been with the 3-M Company for 17 years. He will assume responsibility for all salesmen handling abrasives and related items in that part of the Cincinnati division included in the states of West Virginia, Kentucky, Tennessee, Alabama, and Georgia.

Mr. Miller, a 3-M employee for 21 years and recently a salesman in Ohio, will remain in that territory in his new supervisory capacity.

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## Additions to Research and Development Staff

The Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., announces the following additions to its research and development staff: Dr. C. E. Inman, formerly with Hooker Electrochemical Company; H. S. Fisher of Aluminum Company of America; O. T. Aepli of Attupulgus Clay Company; and E. P. Street, recent graduate of Yale University.

---

## Veteran Employees Honored

Veteran employees of the Maas & Waldstein Company were recently honored at a party on the firm's premises, 438 Riverside Ave., Newark, N. J. The guest of honor was John Weber, 73, of Bloomfield, N. J., who has spent 50 years with the company. He now supervises the handling of nitrocellulose which is used in lacquer production.

G. Klinkenstein, vice president of the company, presented Mr. Weber with a 50-year service pin, diamond ring, and $500 War Bond. He also awarded gold watches and 25-year service pins to five other employees.

# FAST AIR DRYING

**BUNATOL** — the easy to apply air drying rack insulation.

There is no argument about the great savings when using a rack insulation that requires NO BAKING. Saves time and money.

**BUNATOL** is a tough, glossy insulation that lasts for a great many plating cycles. It rinses freely and does not carry over solutions. Made to stand high temperature cleaners and built-in chemical resistance for acids and alkalies.

If you are not acquainted with **BUNATOL** rack insulation send us one of your racks and let us insulate and return to you promptly for testing (no charge of course). Then you will see why **BUNATOL** insulation has the lowest cost-per-hour of use.

**NELSON J. QUINN CO.**

**TOLEDO 7, OHIO**

160 **BUNATOL** 720

## Technical and Production Advisor

The appointment of William M. Gibson to the newly created position of technical and production advisor to the eight American-Marietta plants is announced by Grover M. Herman, president. Mr. Gibson, superintendent of the paint company's Kankakee plant since 1940, was with the Rinshed Machine Company, Detroit, for four years and previous to that held important positions with the Cook Paint and Varnish Company in Kansas City, Detroit, and Cincinnati. He has a degree in chemical engineering from the University of Missouri.

Arthur L. Gately, who has advanced through various positions in his 20 years with the company, has been made assistant superintendent of the Kankakee plant.

## Master Metal Finishers Association

A Massachusetts Charter has been issued to the recently organized Master Metal Finishers Association of New England, Inc., which has established its office in the Boston Chamber of Commerce Bldg., 80 Federal St., Boston.

Officers of the association are as follows: president, Rosario A. Campisi, Industrial Enameling Corp., Boston, Mass.; vice president, Colgate Gilbert, Gilbert Associates, Inc., Walpole, N. H.; treasurer, Louis Tosi, Cambridge Plating Co., Cambridge, Mass.; clerk, Robert L. Smith, Tuttle Plating Co., Boston, Massachusetts.

Rosario A. Campisi

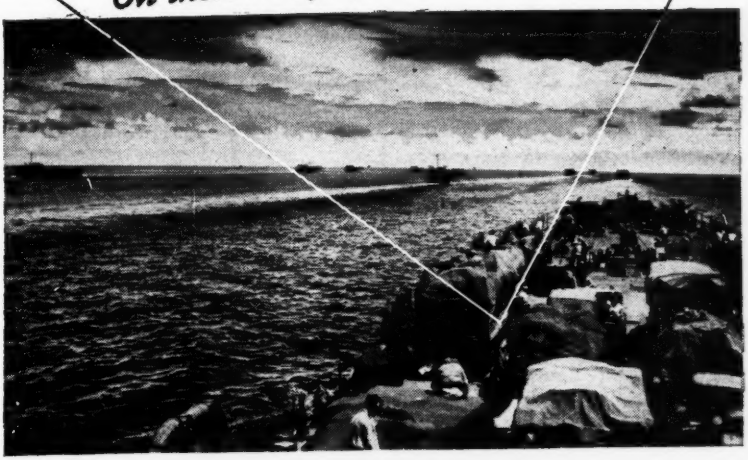
The association has been active during the past few months in assisting the Office of Price Administration in the preparation of OPA Regulation 581. Several open meetings for the entire industry in New England have been held at the Hotel Statler with Boston regional OPA officials present to clarify the provisions of this price controlling regulation. Walter R. Guild, a professional trade association manager, has been employed to serve as managing director of the Master Metal Finishers Association.

Mask Your Parts for Painting · Spraying · etc. with
PRECISION PROTECTORS
Parts surfaces absolutely protected to clean sharp line where you want it. Tough spirally wound fibre. Shapes to fit—regular or irregular. Does not affect surface in any way. Economical. ● Also most efficient as Dust Caps and Thread Protectors for parts in storage or transit. External and internal. Send for samples and prices.
PRECISION
PAPER TUBE CO.
2053 W. Charleston
Chicago 47, Ill.


## McKim Joins Roxalin

E. D. Horgan, vice president, Roxalin Flexible Finishes, Inc., Elizabeth, N. J., announces that Walter A. McKim has joined the Roxalin organization. Mr. McKim will be active in the firm's postwar technical sales development program.

*On their Way again to Win again!*



# Are You?

**Today** veterans of our European victories are sailing to final triumph in the Pacific! Meanwhile American industry is following a full-speed program to hasten peace through the Payroll Savings Plan!

From coast to coast, veteran Bond salesmen are again mustered into service for plant-wide selective resolicitation campaigns, designed to:

★ **Hold all new 7th War Loan subscribers on Payroll Savings Plan books, maintaining or increasing present allotments—**

★ **and convince all regular subscribers, who recently stepped up their Bond buying, of the advantages of continuing on this patriotic, save-more basis.**

**Back up our fighting men who have won one war—and are out to win another! Use selective resolicitation to step up your Payroll Savings Plan—tighten the rein on inflationary tendencies—build peacetime prosperity.**

*The Treasury Department acknowledges with appreciation the publication of this message by*

PRODUCTS FINISHING

*This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council*

1896 - Our Standard - 1945

U S A
Brand Felt Wheels

prove their value in any test.

We shape Bobs and Wheels
to sketch.

Sheet Felts for Manufacturers
of

Shoe Machinery
Wall Paper Print Rolls
Jewelry
Glass
Lenses
Leather
Brass
All Mechanical Tools
Artificial Limbs

High Quality Goods which can be depended on for satisfactory results.
*TRY THEM.*

*Catalog sent on request.*

EASTERN FELT COMPANY

*Manufacturers*

80 CANAL ST., WINCHESTER, MASS.

## Appointed Technical Assistant

Dr. Nelson W. Taylor has been appointed to the post of technical assistant to the director of research of the Minnesota Mining and Manufacturing Co., St. Paul, Minn. In addition, he will also continue as head of the ceramics section.

Before coming to the 3-M Company in November, 1943, Dr. Nelson was head of the ceramics section at Pennsylvania State College.

Dr. Nelson W. Taylor

## Technic, Inc.

According to an announcement received, Technic, Inc., an enterprise serving the metal and jewelry finishing industries, has been recently organized at 39 Snow St., Providence, R. I. Offered is a complete metal-finishing service covering consulting, analytical, research and engineering work, as well as specification testing, plating room design, and salt spray testing.

Products available include Trushade 24 kt. soluble gold (aqueous), white brass, antique smuts, black finishes for brass, copper and silver, soluble hard gold alloy (aqueous), 14 kt. soluble gold alloy (aqueous), flame flux, wetting agents, pink soluble gold alloy, soluble green gold alloy, immersion tin, gold strip, aluminum pre-plate, and Protectox (invisible oxide).

Hammond of Kalamazoo

# THESE FEATURES ESSENTIAL TODAY— ARE TOMORROW'S NECESSITIES!

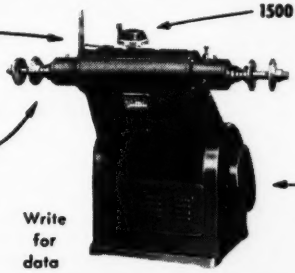
**HAMMOND VARIABLE SPEED LATHES for POLISHING and BUFFING**

**Combination SWITCH & BRAKE**

Foolproof operation and complete safety provided. Supplied as standard equipment.

**Overhanging Spindle**

Large or bulky pieces handled without interference. Ball bearing spindle construction provides smooth, vibrationless operation.



Write for data

**1500 to 3000 RPM INSTANTLY**
***The DIAL does it!***

Finer, better, more uniform finishes obtained by maintenance of constant peripheral speeds. Quick change provides wider range of work handled.

**MOTOR-IN-BASE**

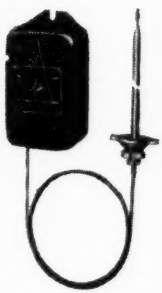
5 and 7½ HP capacity for continuous two-man operation increases production.

Hammond Machinery Builders INC

**1622 DOUGLAS AVE., KALAMAZOO 54, MICH. Eastern Branch: 71 W. 23rd St. N. Y. 10, N. Y.**

# BARBER-COLMAN

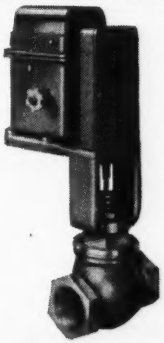
## MICRO SYSTEM *for* FINISHING CONTROL



**REMOTE BULB MICROTHERM**

Plating tanks, anodizing baths, and many other finishing operations where uniform temperature must be maintained, can be improved by using the Barber-Colman automatic electrically-operated "MICRO System" of temperature control equipment. Features include simple construction, no relays, and maximum power at all points of the valve stroke: "Hunting" is eliminated and the valve is positioned quickly with "micrometer accuracy."

*Write for Bulletin*
**"CONTROLS FOR INDUSTRY"**

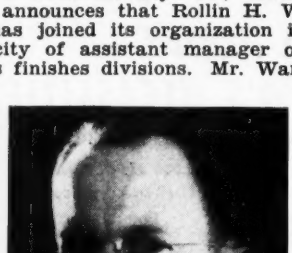


**PROPORTIONING VALVE**

**BARBER-COLMAN COMPANY**
1248 ROCK ST. • ROCKFORD, ILL.

## Joins Jones-Dabney

The Jones-Dabney Co., Louisville, Ky., announces that Rollin H. Wampler has joined its organization in the capacity of assistant manager of one of its finishes divisions. Mr. Wampler,



Rollin H. Wampler

a Tau Kappa Alpha and graduate of Bridgewater College, was formerly technical director of the Southern Varnish Corp., Roanoke, Va. He was recently elected chairman of the Virginia Blue Ridge Section of the American Chemical Society and is the author of numerous technical papers on finishing problems. His book "The Industrial Application of Modern Organic Finishes" will be published by the Chemical Publishing Company this fall.

## Murphy to Head Development Division

Frank E. Murphy, formerly assistant to the manager of the Research and Development Department, has been appointed director of the Development Division, Research and Development Department, Pennsylvania Salt Manufacturing Co., Philadelphia, Pennsylvania.

In his new position, Mr. Murphy will have charge of chemical engineering activities, including pilot plant operations, engineering research, and related fields of work. He will be located at Whitemarsh Research Laboratories although a substantial amount of the work involved will be carried out at various plants of the company.

## Carborundum District Sales Managers

The appointment of William H. Homeyer and Francis J. Blake as district sales managers is announced by F. J. Tone, Jr., vice president and general sales manager, The Carborundum Co., Niagara Falls, New York.

Mr. Homeyer, with headquarters at Los Angeles, is to have charge of the Southern California sales area and Mr. Blake, whose headquarters will be in San Francisco, will have charge of the Northern California sales area. Both men have been long situated and are well known in Pacific Coast industrial districts, having previously represented Carborundum as industrial salesmen.

## Charles W. Yerger Retires from H-VW-M

Charles W. Yerger, for a number of years vice president in charge of sales for the Hanson-Van Winkle-Munning Co., Matawan, N. J., and more recently executive vice president, has retired from the company. Mr. Yerger's ability and warm personality gained him the respect and affection of all his associates in the H-VW-M Company. He leaves with all of their good wishes.

BETTER PLATING, LESS COST!
"MGC" ELECTROPLATING EQUIPMENT
Write for Interesting Details TODAY!
MOTOR GENERATOR CORP. HOBART SQ. PF-85 TROY, OHIO

## Raynolds Elects Three New Directors

Following a directors' meeting authorizing the addition of three new directors, Clarence W. Slocum, Roy A. Plumb, and Eric W. Peniston were elected to the staff of directors of the Devoe & Raynolds Co., Inc., New York. Mr. Slocum is well known in the paint industry, having served in the Federal Government alternately as consultant and associate price executive of the Chemical Branch of OPA. He is president of the Beckwith-Chandler Company, manufacturer of railroad and industrial product finishes, recently acquired by the Devoe & Raynolds Company.

Mr. Plumb is president of Truscon Laboratories, Inc., which became affiliated with Devoe & Raynolds in May, 1945. He is well known in the industry because of special contributions in the way of compounds for waterproofing concrete; also for new developments in the field of rust inhibitive paints for structural steel.

Mr. Peniston is presently a Lieutenant in the U. S. Navy on leave from R. C. Rathbone & Son, Inc.

## Todd Returns to H-VW-M

The Hanson - Van Winkle - Munning Co., Matawan, N. J., announces that Nelson Todd has rejoined the company as assistant to the president. He has been re-elected a director in the company.

---

**Acidproof Chemical Stoneware.** An eight-page bulletin covering a full line of high grade, acidproof chemical stoneware has been issued by the General Ceramics and Steatite Corp., Chemical Equipment Division, Keasbey, N. J. Described and pictured are ceramic bodies and apparatus possessing characteristics to meet a wide range of requirements in the chemical and process industries.

The bulletin not only deals with standard equipment of the company, but also emphasizes its new line of completely engineered items and shows typical apparatus of this type. Over 70 pieces of standard equipment are listed in alphabetical order, and a page is devoted to interesting examples of special order work. Copy of Bulletin Ch. E-R free to individuals addressing requests on their company letterheads.


SMALL • EFFICIENT • INEXPENSIVE • PRACTICAL

**DUCON UNIT-TYPE DUST COLLECTOR *for dust control at machines***

Dust is a serious health hazard and wears out machinery bearings needlessly. DUCON solves these problems by stopping all the dust.

Compactness is combined with efficiency in DUCON design which features multiple numbers of cloth filter bags to provide maximum filter area to air flow.

Filter bags readily cleaned by positive shaker and the dust thus dislodged drops to and accumulates in receptacle pan at bottom of unit. DUCON cloth filter bags last indefinitely providing low cost dust control without constant maintenance.

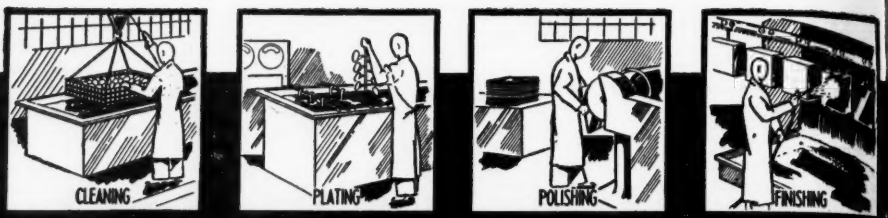
Complete information given in Bulletin No. 243. Ask for your copy.

**THE DUCON COMPANY**

*Air and Gas Washers—Cyclones —Dust Control Systems*

**259 Norman Avenue**
**Brooklyn 22, N. Y.**

DUCON Unit showing filter bag arrangement.
Capacities 200-800 Cubic Feet of Air per minute—four standard sizes.



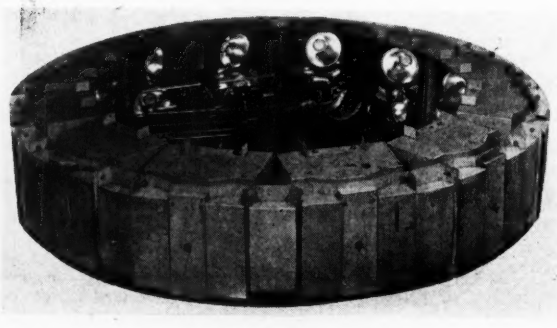

# New Equipment and Materials

## Miskella No. 600 Series "Tub" Oven

Primarily designed for the small shop or occasional user as an accessory to a spray booth when no conveyor is available, the Miskella No. 600 Series "Tub" Oven developed by Infra-Red Engineers and Designers, 1632 E. 40th St., Cleveland 3, Ohio, is intended for processing work that is not moving while being baked. Of sectional and portable design, the oven is provided with sealed-in vacuum reflector lamps (except in the 1000-watt type). A portable floor stand with utility shelf underneath can be furnished for the unit on special order.

Described as a flat "sandwich" type having a reflective metal interior and painted steel exterior with insulation between, the Miskella Tub Oven includes necessary vents for air in-take and out-go. A one story oven is 11 inches high, a two story oven is 22 inches high, and a three story oven is 33 inches high. Each story is made up of a "ring" of standard Miskella units and each Tub includes one or more stories.

According to the manufacturer, the Miskella No. 600 Series Tub Oven may be used for baking parts coated with air dry lacquer, thereby speeding up drying time. The Model 608 can be used to bake one complete typewriter, while the Model 612 can be used for baking as many a four typewriters at one time. To process work setting in a fixed location, such as a foundry ladle, the Tub may be suspended from a crane or a counterbalance. A switch is provided for each pair of lamps in the oven, thus allowing the temperature desired to be set at will.



Miskella No. 600 Series "Tub" Oven

## "United" Desiccite No. 25

"United" Desiccite No. 25, an alternate for silica gel in Method II Packag-

Rustless Electropolishing Demonstration Unit

ing for export shipping, is the name of a product now being offered by the D. C. Cooper Co., Dept. P. F., 20 E. 18th St., Chicago 16, Illinois.

According to the manufacturer, Desiccite No. 25 absorbs a maximum of moisture per unit and is very economical to use. Approved by all branches of the armed forces, it is packed in bags of from 7½ grams to 7½ lb. and is also available in bulk.

## Pennsalt PM-90 Cleaning and Descaling Compound

A specially prepared acid cleaning and descaling compound designated as Pennsalt PM-90 has been placed on the market by the Special Chemicals Division of Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pa. The material, which contains addition agents for surface action and inhibition, is primarily intended for use as a pickling bath concentrate in electroplating shops and as an acid cleaner for removing water scales from boilers and industrial equipment.

Pennsalt PM-90 Cleaning and Descaling Compound is packaged in 115-lb. returnable carboys.

## Rustless Electropolishing Demonstration Unit

To assist fabricators of stainless steels to prepare for production of civilian goods, the Market Development Division, Rustless Iron and Steel Corp., 3400 E. Chase St., Baltimore 13, Md., is making available at no cost electropolishing demonstration units using the Rustless patented process. Rustless engineers will direct installation of the models and assist in the initial use of the citric-sulphuric process which is particularly applicable to the finishing of complex formed and welded wire products and other small items difficult to finish mechanically. The units will be distributed to interested manufacturers of stainless steel articles after samples of the individual items have been treated at the Rustless plant and it has been determined practical to electropolish them.

The demonstration unit comprises a lead-lined tank of treated wood with inside dimensions of 6 x 18 x 12 inches. It has two cathode bars and one anode bar, with the item to be electropolished being attached to the anode bar. Also included are a relay for temperature control of the bath, a temperature regulator, and ammeter, and a heater. Components of the solution, which is restricted to the electropolishing of stainless steels, are 15-20 per cent sulphuric acid, 55-60 per cent citric acid, and 20-30 per cent water. Approximately 5.83 gallons of solution are used in the unit.

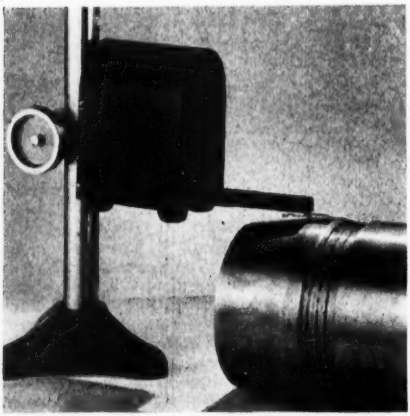
## McKeon's "Black'n Brass"

Known as "Black'n Brass," a material for producing sulphide black finishes directly on many types of brass is now being offered by the Sulphur Products Co., Inc., Greensburg, Pa. With suitable modification of technique, the material, it is claimed, will produce a sulphide black finish on practically all types of solid or plated brass.

To use, the work to be blackened should be thoroughly cleaned with hydrochloric acid followed by an alkaline cleaner. After rinsing thoroughly, the work can then be immersed in the Black'n Brass solution.

## Brush Rough-Finish Measuring Head

The Brush Development Co., 3311 Perkins St., Cleveland 14, Ohio, announces a rough-finish measuring head designed for checking the rougher surface finishes of and waviness in metals, plastics, plated and painted materials.



Brush Rough-Finish Measuring Head in Use

Described as an excellent complement for the original Brush surface analyzer, the new pickup and drive head is said to accurately measure irregularities from 100 to 3,000 microinches, peak to valley. It thus extends the use and range of the Brush surface analyzer from 1 to 3,000 microinches.

## Cowles KW Clean Bright Brass Cleaner

The Cowles Detergent Co., 7016 Euclid Ave., Cleveland 3, Ohio, announces a high speed, efficient, free-rinsing brass cleaner designated as Cowles KW Clean Bright Brass Cleaner. The material can be used in a still tank (with or without electric current) and in washing machine equipment.

According to the manufacturer, KW cleans bright and does not attack or tarnish the metal. The material is also said to be adaptable for cleaning die castings.

## "Ucilon" Surface Coating Material

"Ucilon," a surface coating material which is said to resist all acids in commonly used concentrates and all alkalies and salts at ordinary temperatures, as well as alcohols, petroleum derivatives, and natural oils, is now being marketed by United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y. Described as non-toxic, non-conductive, and inhibitive to fungus, the material can be used to protect the surfaces of process equipment, piping, walls, beams, ductwork, tanks, and so on. It is said to produce an attractive glossy finish on metals, wood, or concrete.

Available in white, clear, black, or colors, Ucilon is compounded from special synthetic resins and can be applied by brushing, dipping, or spraying methods similar to ordinary paint. Formulations for special needs, such as quick drying, elasticity, matte surface, and so on, can also be obtained.


**For CLEAN Finishing Surfaces —PERMAG Cleaning Compounds**

A *clean* surface on metal prior to finishing is imperative.

PERMAG Compounds produce a *chemically clean* surface — quickly and economically. PERMAG Compounds help solve the tough problems for electroplaters. *Details on request.*

**MAGNUSON PRODUCTS CORPORATION**

**50 Court St. - - - - - - Brooklyn 1, N. Y.**

*In Canada: Canadian PERMAG Products, Ltd., Montreal - Toronto*

# QUALITY
## RUBBER BOOTS
## For added safety

**KNEE LENGTH**

Type 4. Sizes 6-12 .....$3.00 pr.
Type 3. (Extra Heavy).. 3.40 pr.
Type 3. Same with Steel Safety Toe ..... 3.90 pr.

**STORM KING**

Type 2. Sizes 6-12 ..... 4.70 pr.

**HIP BOOTS**

Type 1. Sizes 6-12 ..... 5.30 pr.

We also carry a complete line of work rubbers, dress rubbers, all-rubber arctics, miners pacs, rubber work shoes, waders and fireman's boots.

• Ration certificates required on all footwear except work, dress rubbers and arctics. See your local O. P. A. Address all orders with certificates to Dept. 58.

Miller RUBBER PRODUCTS

**PRODUCTS COMPANY, Inc.**
**29 WARREN STREET • NEW YORK 7, N.Y.**

**POINTS consistently to Plating Solutions FILTERED by the**

## SPARKLER "Horizontal Plate"

Your finishes will stand close inspection and rejects will become a memory, if your solutions are treated by Sparkler Filters. Because the Sparkler process removes every trace of dust and dirt that cause rough, pebbly finishes. It always keeps solutions in a bright, clean, serviceable condition for smooth satisfactory application.
Our field engineers are at your service.

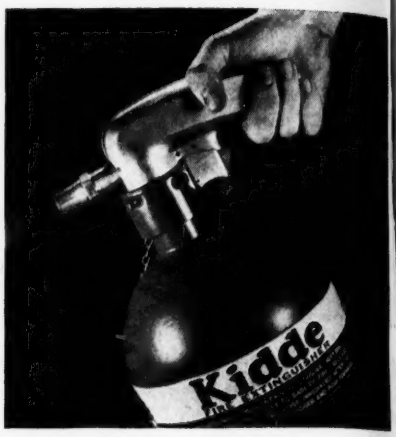
**SPARKLER MANUFACTURING COMPANY**
**254 LAKE STREET** **MUNDELEIN, ILLINOIS**

SPARKLER HORIZONTAL PLATE FILTERS

## Trigger Control for Kidde Large Portable Model Extinguishers

The trigger control which has distinguished the smaller sizes of carbon dioxide fire extinguishers offered by Walter Kidde & Co., Inc., 140 Cedar St., New York 6, N. Y., has now been extended to the larger portable models. The trigger is actuated by an upward pull of the index finger, the largest extinguisher requiring approximately the same trigger force as the smallest. When desired, the trigger can be latched open by a slight forward motion and as easily disengaged to avoid wasting gas.

Small, compact, and relatively light in weight and simple in design, the trigger valve, according to the manufacturer, provides for on-and-off control of discharge with a minimum of effort; permits a high rate of flow of the carbon dioxide, avoiding directional changes in its passage insofar as possible; and allows for easy locking open with one hand. A streamlined one-piece handle closure protects the valve itself, with the handle being designed to fit the hand comfortably.




Kidde Large Model Fire Extinguisher with Trigger Control

Other improved features of the extinguisher as a whole include a permanent bushing and removable siphon tube which allow for inspection, periodic hydrostatic testing, and, when necessary, replacement of any part without devalving. The locking pin of the trigger fits into a blind hole so as to eliminate the possibility of becoming bent or jammed, and the seal wire is placed where it is least likely to be broken and most easily observed. The extinguisher is carried and operated with one hand, leaving the other hand free at all times to manipulate the discharge nozzle.


Now for EVERY WORK SHOP!

NEW Invention Electroplates by BRUSH

Easy to Plate CHROMIUM GOLD, SILVER, NICKEL, COPPER

. . . For Pleasure and Profit!

If you have a workshop—at home or in business—you need this new Warner Electroplater. At the stroke of an electrified brush, you can electroplate models and projects—you can replate worn articles, faucets, tools, fixtures, silverware, etc with a durable, sparkling coat of metal . . . Gold, Silver, Chromium, Nickel, Copper or Cadmium. Method is easy, simple, quick. Everything furnished — equipment complete, ready for use. *By doing a bit of work for others, your machine can pay for itself within a week.* So make your shop complete by getting a Warner Electroplater right away. Send today for FREE SAMPLE and illustrated literature. ACT AT ONCE!

- MODEL MAKERS
- MAINTENANCE
- HOBBY SHOPS
- HOME SHOPS
- SALVAGE PARTS

Warner Electric Co., Dept. C-5
663 N. Wells St., Chicago 10, Ill.


## G-Sol 195 Safety Solvent

Designed with particular attention to factors of safety, non-corrosiveness, and solvency range, G-Sol 195, a safety solvent for use in cleaning precision bearings, instrument parts, typewriters, and similar mechanisms where both grease and oil gums are troublesome, has been announced by the Gaybex Corp., P. O. Box 3, Nutley 10, N. J. Water white and characterized by a high flash point and freedom from elements of toxicity and corrosion, the solvent is said to provide parts thus cleaned with unusual resistance to rust, fingerprints, and other types of stains.

G-Sol 195 Safety Solvent is available in 5 and 54-gallon drums.

# Save Fingers

**Steel-Grip Finger Guards**

Hundreds of factories are saving time and injuries in war production by protecting workers with Steel-Grip Finger Guards. Used for handling rough or sharp articles, for buffing, grinding, sanding, polishing, punch press work and hundreds of other jobs. Protect fingers or thumb, front or back, from cuts, abrasions or blisters. Made of durable leather with elastic web back for snug, cool, comfortable fit. Easy on and off. One size fits all, men or women. Send 10c each for samples or trial order box of 50 at 8½c each, less 10%. *Catalog of Steel-Grip Safety Apparel free on request.*

*Famous Industrial Safeguards Since 1910*

**INDUSTRIAL GLOVES CO.**

**714 GARFIELD BLVD. DANVILLE, ILL.**

*Canada: Safety Supply Co., Toronto*



*A fast, practical, scientific*

# PRE-TEST FOR WEAR RESISTANCE

**The TABER ABRASER**

**gives "Advance Data"**

**on the Wearability of**

**PAINTS·LACQUER·PLATING**

**LEATHER·RUBBER·PAPER, Etc.**

In checking the wearability of your own products as compared with competitors', as well as in research on new developments—the Taber Abraser gives you an accurate rating of resistance to surface abrasion quickly, simply. Eliminates slow, costly performance tests. Used by hundreds of manufacturers and research laboratories. . . . Full particulars on the Taber wear testing procedure will be sent on request. No obligation.

**TABER INSTRUMENT CORP.**

**111PF Goundry St., North Tonawanda, N. Y.**

**The Taber Test *Proves* What Wears Best!**



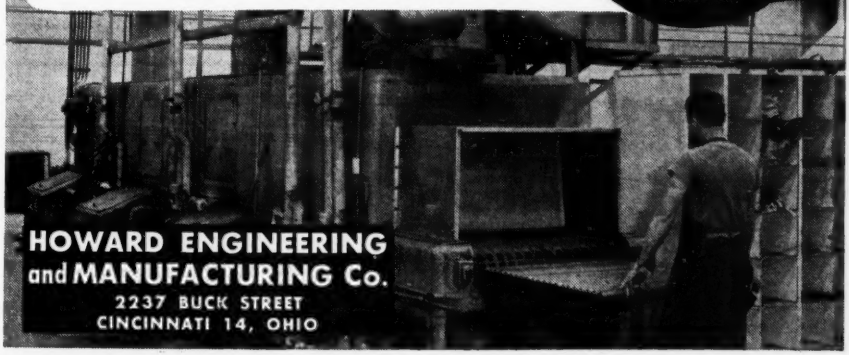
# HOWARD Machine

This HOWARD Conveyor Wash, Double Rinse and Dry Machine is installed in the Kansas City plant of North American Aviation, Inc. Cleans and dries a wide variety of parts efficiently and economically. Consult Howard Engineers on your cleaning or finishing work.

*Write for catalog.*

**MACHINERY for PICKLING • TUMBLING • WASHING • DRYING • DEBURRING • QUENCHING • BURNISHING**

**Cleaning and Drying AIR SCOOPS for MITCHELL BOMBERS**



**HOWARD ENGINEERING and MANUFACTURING Co.**

**2237 BUCK STREET**

**CINCINNATI 14, OHIO**

## Master "Handee Finisher"

An abrasive tool designed for machine shop as well as production use, to be known as the "Handee Finisher," has been placed on the market by the Master Specialty Co., 5700 Cedar Ave., Minneapolis 7, Minn. Light in weight and well balanced to allow for continuous use with a minimum of fatigue, the tool is arranged so that six 12-inch abrasive strips can be placed on it at

Master "Handee Finisher"

one time. When the outside strip becomes worn, it can be quickly removed and the next strip tightened in place by means of a knob located on the handle of the tool. Thus, a new sharp abrasive cloth is instantly available whenever desired, with the cloth being firmly held in place to permit accurate control.

The Master Handee Finisher can be used in quickly removing flash from plastic parts without danger of nicks, it is claimed. In addition, hardened tools and dies can be smoothed and polished by means of the tool, which can also be used to deburr intricate stampings. Moreover, file and grinder marks are said to be easily removed from castings with the Handee Finisher.

---

## "Plasto-Pak" Protective Strip Coating

Known as "Plasto-Pak," a cold dip strip coating which is designed to prevent the corrosion, tarnishing, or scratching of metals during production, assembly, shipping, or storage has been placed on the market by the Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y. Approved for Method 1B Packaging by U. S. Army Signal Corps, the coating can also be applied by spraying.

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## Penchlor Acid-Proof Cement

An acid-proof cement for use in the construction of pickling and other tanks is now being marketed under the trade name of Penchlor by the Special Chemicals Division, Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pa. Designed to resist corrosion and also to withstand physical abuse resulting from submerging steel parts in and withdrawing from pickling solutions, the cement is said to set quickly, thus reducing construction delays.

A self-hardening sodium silicate type, Penchlor Acid-Proof Cement, according to the manufacturer, has exceptionally long life and is unaffected by all acids—hot or cold, dilute or concentrated—except hydrofluoric acid. Used as a mortar the cement is said to adhere firmly to brick, steel, glass, lead, rubber, and asphalt.


**ALLWOOD**

***"Vienna Brand" Lime***

Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.

*WRITE FOR FULL PARTICULARS*

**ALLWOOD LIME COMPANY**

Manitowoc • Wisconsin

**SOL-KLEAN**

**for**

**Better Paint Adhesion**

**INDUSTRIAL CHEMICAL PRODUCTS CO.**

DETROIT 7

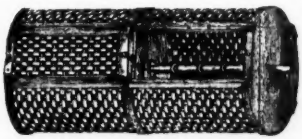
Milwaukee Fort Wayne

For present day and future requirements, use a Lupomatic DEBURRMASTER machine to deburr, cut down and polish metal and plastic parts.

A DEBURRMASTER installation reduces your production costs and improves your product.

Send samples today for a free demonstration.

**LUPOMATIC TUMBLING MACHINE CO., INC.**
4510 BULLARD AVE. BRONX, N. Y.



## King White-Oak Plating Barrels

*COMPLETE RANGE OF SIZES*

in both open and close weave construction are available for all mechanical plating equipment. Special sizes fabricated to your specifications.

White Oak barrels will produce a clean, fast, smooth and clean plate.

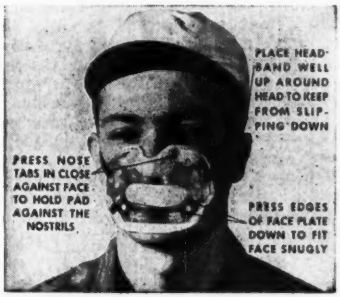
***Write for new catalogue and specification sheets today.***

**JOHN KING** 48 SPRINGFIELD ST. DAYTON 3, OHIO

## SEND $1.00 FOR ONE MARTINDALE PROTECTIVE MASK and 50 No. 1 Refills

or $1.25 if you prefer No. 2 Refills

**Weigh Less Than ½ oz.**


PLACE HEAD-BAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

*Not Recommended for Toxic Dusts or Free Silica*

**LIST PRICES—F.O.B. CLEVELAND, OHIO**

| | |
|---|---|
| Masks | $0.25 each |
| No. 1 Refills (std. weight) | .01½ each |
| No. 2 Refills (heavyweight) | .02 each |

Masks packed in individual envelopes.

Refills packed in envelopes of 25.

The No. 2 Refills contain twice as much filtering cotton as the No. 1.

***Write for Bulletin 348 showing quantity discounts on orders of $5.00 and over***

**If payment accompanies order we will pay parcel post or express charges. Minimum order for C.O.D. or charge account $2.00**

**Martindale Electric Co.**
1367 HIRD AVE. CLEVELAND 7, OHIO

## M.S.A Chemical Cartridge Respirator

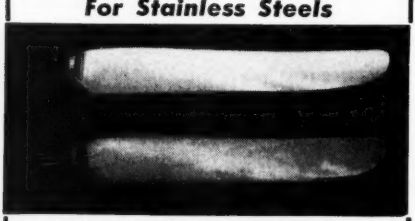
Approved by the U. S. Bureau of Mines under its newly-established Schedule 23, a chemical cartridge respirator designed for protection against low concentrations of organic vapors is announced by the Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa. According to the manufacturer, the respirator provides protection against vapors in concentrations up to 1,000 parts per million of such substances as acetone, alcohol, benzene, carbon tetrachloride, ether, formaldehyde, gasoline and petroleum distillates, and toluene.

The floating-cushion flexible facepiece with a soft rolled edge forming a wide area of contact is said to assure a quick, gas-tight fit of the respirator on persons of widely facial shapes and sizes. A nose strap provides for automatic adjustment of the facepiece across the nose.

Equipped with twin, replaceable, all-metal filter cartridges designed for high efficiency, the M. S. A. Respirator is claimed to assure maximum comfort, low breathing resistance, and a balanced, easy fit. A guarded exhalation valve provides extremely low resistance to exhalation. Simplicity of cleaning and maintenance are additional outstanding features of the respirator.

M.S.A. Chemical Cartridge Respirator


**HIGH LUSTRE**
***For Stainless Steels***



*"You see the Difference"*

4A

**POLISHING COMPOUNDS**

Produce that extra value in a beautiful finish — are known for economical cutting, cut and color and mirror finishing on all kinds of steel including stainless and carbon steels and hard-to-buff alloys.

**SAMPLES ON REQUEST**

**HARRISON & COMPANY**
HAVERHILL, MASSACHUSETTS
*Polishing Compounds*
*Coloring Rouges—4A Cement and Thinner*


## "Kelite Control" Pickling Inhibitor

A controlled pickling inhibitor developed by Kelite Products, Inc., Los Angeles, Calif., is designed to protect metal and save acid by causing the pickling acid to work on the scale only. Marketed under the trade name of "Kelite Control," the inhibitor is said to prevent attack on healthy metal and to reduce the possibility of hydrogen embrittlement.

Kelite Control Pickling Inhibitor is a reddish brown liquid which is soluble in either sulphuric or muriatic acid. It is supplied in 5-gallon cans and 15 and 55-gallon drums.

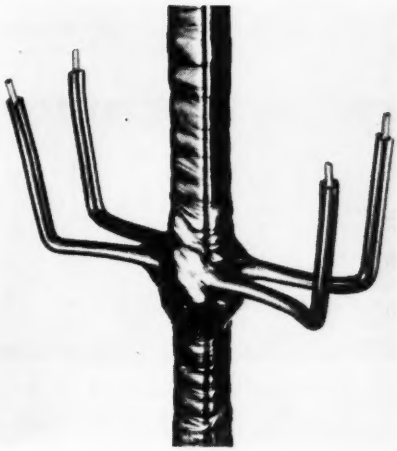
## "Miccrotube" Plating Rack Insulation

A material for the insulation of plating racks, to be known as "Miccrotube," has been announced by the Michigan Chrome and Chemical Co., 6342 Jefferson Ave., Detroit 7, Mich. A companion product to the firm's Miccrotape

with which it is usually used, Miccrotube comprises an extruded tubing made from a tough, elastic plastic base material that is claimed to have exceptional resistance to plating baths and cleaning solutions.

According to the manufacturer, Miccrotube will withstand hot plating solutions, including 180 to 190-degree copper solutions, and practically all types of boiling cleaning solutions indefinitely without damage or deterioration. It is not recommended for use in trichlorethylene. Miccrotube is said to remain tough and flexible under the most adverse conditions and, it is claimed, will not harden or crack. Its surface is smooth and glossy, thus permitting solutions to drain from the racks quickly and thoroughly.

In using Miccrotube, the contact wires of the plating rack are covered with the insulation and the spline is wrapped with Miccrotape. The two materials can then be fused by heating into a continuous, homogeneous coating. In this way, a solid protective coating of any desired thickness can be quickly and easily obtained without repetitious dipping and drying. On certain types of racks, it is possible to insulate the entire rack with Miccrotube.



Close-up view of a plating rack with Miccrotube on the contact wires and Miccrotape on the spline and at the joints

Miccrotube is available with inside diameters ranging from $\frac{1}{16}$ to 1 inch.


# NOW *THAT'S* METAL CLEANING!

***Fidelity Cleaners and Strippers Do A Thorough Job and Do It Economically***

Preparation of a metal surface for plating and other types of finishing requires proper cleaning and stripping compounds. Since every metal has its individual structural characteristics, a compound must be used which will work most efficiently on the particular type of metal you are using.

Whatever your metal cleaning requirements, they can be quickly surveyed by a Fidelity service engineer. He will recommend the compounds to do your job most efficiently and economically. Call on him today.

**FIDELITY CHEMICAL PRODUCTS CORP.** 430 RIVERSIDE AVE. NEWARK 4, N. J. HUmbolt 3-3640

*"Serving industry with cleaning and stripping compounds"*

## Willson Safety Spectacles

Safety spectacles in a complete range of sizes to fit all types of faces are

Willson Safety Spectacles

now being made by Willson Products, Inc., Reading, Pa. Available in 20 frame sizes, the spectacles feature plastic rocker nose pads which are self-adjusting to the size of the bridge, and adjustable cable temples.

Similar to eye glasses in appearance, the Willson Safety Spectacles protect the eyes without attracting attention. The frames are said to look exactly like ordinary prescription spectacle frames, and the safety spectacle lenses may be ground to prescription if desired. Designed to provide maximum eye protection, the super-tough lenses are heat treated, and each lens is individually tested for impact strength and optical clarity. Frames are reinforced.

The spectacles are available in clear or Willsonite green glass with or without a variety of ten types of side shields in clear or green plastic, wire mesh, or leather. Clear flat lenses, 1.25 or 6 curve, or flat Willsonite lenses in four shades may be obtained.

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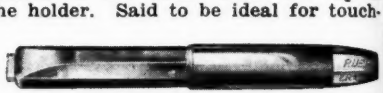
## Rush-FybRglass Eraser

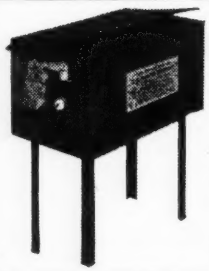
A unique adjustable type eraser incorporating a series of fine glass fibers as the abrasive medium is now being marketed by The Eraser Co., Inc., Syracuse 2, N. Y., under the trade name of Rush-FybRglass Eraser. Useful in electrical, radio, and manufacturing fields, the eraser can be employed to clean oxide and enamel from the fine wire coils of potentiometers and rheostats to ensure positive contacts, as well as in cleaning surfaces prior to soldering or brazing. In addition, the eraser can be used to clean lacquer from metal buttons before polishing and to remove rust and grease from unblued parts of small arms.

According to the manufacturer, the Rush-FybRglass Eraser provides a high polish on any type of metal, the abrasive or polishing qualities desired of the FybRglass depending on the projection of the brush from the tip of the holder. Said to be ideal for touch-



Rush-FybRglass Eraser

ing up and polishing in the corners of molds or cavities, the eraser can be used for removing rust and tarnish from delicate instruments and mechanisms, including watches. FybRglass refills for eraser are readily available.

**HEAT WAX (AXS 1015)** For Export Packaging
**"UNITED" DESICCITE No. 25**

**CLEAN METALS *Faster! Cheaper! Safer!***

Cooper specially engineered electric or gas heated thermostat controlled tanks pay for themselves in a hurry. A multitude of uses. 5, 15, 30, 60 gallon sizes and larger. Quick delivery. Write for circular.

*Also Chemicals, Rust Preventatives, Silica Gel, Etc.*

**D. C. COOPER COMPANY, 20 East 18th Street, Chicago 16, Illinois**

## "Rubykote" Coated Abrasive Cloth

A coated abrasive cloth with natural "chip clearance," to be known as "Rubykote," is now being manufactured by Wilmington Abrasive Works, Wilmington, Del. The grain used in the production of the cloth is of high quality red-colored aluminum oxide which has been specially processed to eliminate weak areas. The process is not only said to produce solid grains but also preserve the sharpness of the cutting edges.

In addition to their improved shaping, the grains are treated so as to adhere firmly to the glue even under unusual conditions of heat and moisture. The coating process is scientifically and accurately controlled so as to provide an ideal ratio of sand to glue and to place each in its proper position.

According to the manufacturer, Rubykote clears itself and will not clog with material, thus providing for cool, even cutting. Available in special "Humi-Sealed" packages to prevent moisture penetration, Rubykote can be obtained in the form of sheets, rolls, belts, and utility rolls.

## All-Brite "Cleanite" No. 500

Designed as an addition agent for caustic etch in very small quantities, a product which is said to definitely increase detergent action, thereby removing smuts and dirt which caustic alone will not remove, is now being marketed under the trade name of "Cleanite" No. 500 by the All-Brite Chemical Co., P. O. Box 1542, Waterbury 89, Conn. The material is also said to increase the uniformity of etching so that aluminum parts will have more even grained surface structures.

In addition, the product is claimed to provide for the trapping of hydrogen fumes which are generally given off when aluminum is etched in hot caustic solution, with the result that personnel is not affected by these extremely obnoxious fumes. According to the manufacturer, this action is accomplished by the formation of a blanket of foam on the surface of the hot caustic solution which successfully keeps the gas in the solution and thus makes for more pleasant working conditions.

Cleanite No. 500 is supplied as a liquid in 5-gallon quantities and in 55-gallon drums.


FULL PROTECTION — LIGHT WEIGHT
LONG WEAR
NU-LITE
PLASTIC SLEEVES, GLOVES WORK APRONS

Provide full protection to workers from troublesome dermatitis induced by industrial irritants. Only 1/7th the weight of conventional protection garments — makes for wearer's comfort and freedom of movement — reducing fatigue.
NU-LITE sheds and resists water, oil, gasoline, strong acids, alkalis, degreasing and plating solutions.
Let us show you how NU-LITE's low cost protection features can boost production in your shop. Samples furnished for approval.

Safety Equipment, Production Aids and Packaging Specialties
NULITE PLASTICS
DEPT. PF VERONA, N. J.



JUST FOR THE RECORD

CEL-U-LAK
A complete line of cellulose derivative lacquers and enamels.

FORM-A-ROC
A unique line of quick-baking, tough adhesive synthetic enamels.

REMEMBER THESE NAMES.

After V-day they will mean something to you.

The Varnish Products Co.
5208 Harvard Ave.
Cleveland, Ohio

## Opportunity Section

Electro-plater for well established, modern Middle-Western cutlery plant; good wages; good living conditions; post war future. All replies in strictest confidence. Write Box 81, care of PRODUCTS FINISHING, 431 Main Street, Cincinnati 2, Ohio.

### CHEMIST WANTED

Position with old established paint and varnish manufacturer located in Newark area. Must have some experience in formulation of Lacquers and Paints. In reply give complete information stating age, previous experience, educational background, etc. Also salary expected. Our employees know about this ad. Write Box 82, care of Products Finishing, 431 Main Street, Cincinnati 2, Ohio.

### WANTED

CHEMIST — PROTECTIVE COATINGS — To facilitate substantial expansion program, successful Eastern manufacturer of standard and specialty finishes offers attractive opening for chemists, aged 30 to 40 years, and by education, experience and natural aptitude to participate with present technical staff in research and development of nitrocellulose lacquers (principally clears, blacks and whites); synthetic resin specialty coatings formulated for industrial application in wood and metal finishing industries. Broad and valuable experience in vinyl coatings for fabrics and corrosive-resisting applications is especially desirable. Long-planned promotion program also includes clear lacquers for high-temperature application and low-baked synthetics, for furniture, rabio cabinets, caskets, etc.; other specialized industrial finishes for rubber, leather, paper, glass, plastics, fabric, wood and metal. Chemists confidently believing their qualifications conform to our "specifications" are especially urged to file application for this opening. Formal application obtainable by addressing card or letter to Box 86, Products Finishing, 431 Main St., Cincinnati 2, Ohio. All replies completely confidential; our present staff is informed of this announcement.

**Gehnrich Ovens.** A four-page illustrated catalog descriptive of the construction of Gehnrich Ovens and the methods they afford for heating, baking, and drying operations has been prepared by the Gehnrich Oven Division, W. S. Rockwell Co., 108 Jewel St., Brooklyn 22, N. Y. Copy of Catalog No. 116 free upon request.

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**"Plastic Coatings Protect Carbide Tipped Tools"** is the title of a four-page bulletin now being issued by the Aeroil Products Co., Park Ave. at 57th St., West New York, N. J., illustrating and describing the use of plastic dipping tanks for coating tools and equipment with ethyl-cellulose or cellulose acetate butyrate. Copy of Bulletin No. 292 free upon request.

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**Corrosion-Resistant Materials and Equipment.** A 16-page bulletin descriptive of some of the corrosion-resistant materials and equipment now available from The U. S. Stoneware Co., Tallmadge Circle, Akron, Ohio, has been prepared by this firm. Treated are Tygon plastic compounds, tanks and lining materials, tubing, gasketing, paint, chemical stoneware, corrosion-resistant masonry, mixing equipment, towers and tower packing. Copy of Bulletin H free upon request.

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**Synthetic Optical Crystals.** An eight-page booklet illustrative and descriptive of how single crystals of lithium fluoride, potassium bromide, and sodium chloride eight inches in diameter are being grown synthetically from their molten salts for use in ultra-violet and infra-red spectroscopes, cameras, and infra-red radiation devices is now being distributed by The Harshaw Chemical Co., 1945 E. 97th St., Cleveland 6, Ohio. Copy free upon request.

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Our soldiers, sailors, and marines need planes, ships, tanks, ammunition, uniforms, and food. You can help to supply them by buying War Savings Bonds and Stamps.

**"Fuzon-O,"** a flexible vinyl resin coating manufactured by The Stanley Chemical Co., East Berlin, Conn., is the subject of a 12-page booklet issued by this firm and which explains and expounds the advantages of this type of coating and the uses for which it is recommended. Copy free upon request.

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**Electroplating Service.** A four-page illustrated bulletin released by the Hudson American Corp., 25 West 43rd St., New York 18, N. Y., illustrates and describes this firm's facilities for complete and efficient silver, tin, cadmium, copper cyanide, zinc, bright nickel and chromium plating and anodizing. Copy free upon request.

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**"Liquid Envelope."** Better Finishes and Coatings, Inc., 268 Doremus Ave., Newark 5, N. J., has issued a 16-page illustrated booklet describing the uses and properties of and containing technical data on its "Liquid Envelope," a peelable plastic film for the packaging or protection of materials or equipment in transit or in storage. Copy free upon request.

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**"Ethyl Silicate,"** a 12-page booklet now being offered by the Carbide and Chemicals Corporation, Unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York, N. Y., discusses the hydrolysis of ethyl silicate and its use as a source of silica. A detailed discussion of the principles of the hydrolysis of ethyl silicate is included, as well as typical formulas for the one-step and two-step methods of preparing silica depositing solutions.

Descriptions of the applications of ethyl silicate illustrate its effective use as a bonding agent in the preparation of molds for metal castings, in the formulation of heat-resistant paint, in cellulose nitrate and vinyl resin lacquer formulations, and as a preservative and weatherproofing agent. Copy of the booklet is available free by requesting Form 5989.


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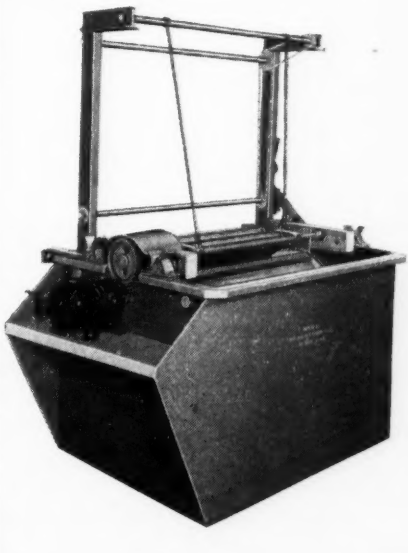

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